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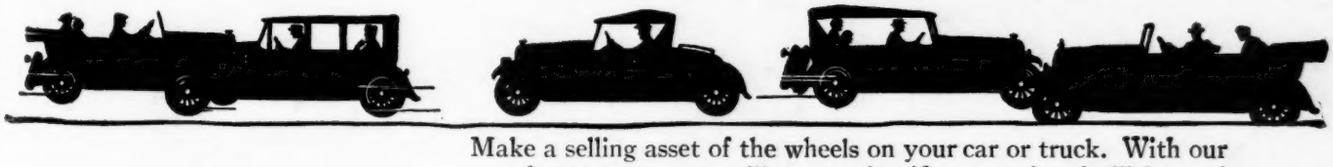

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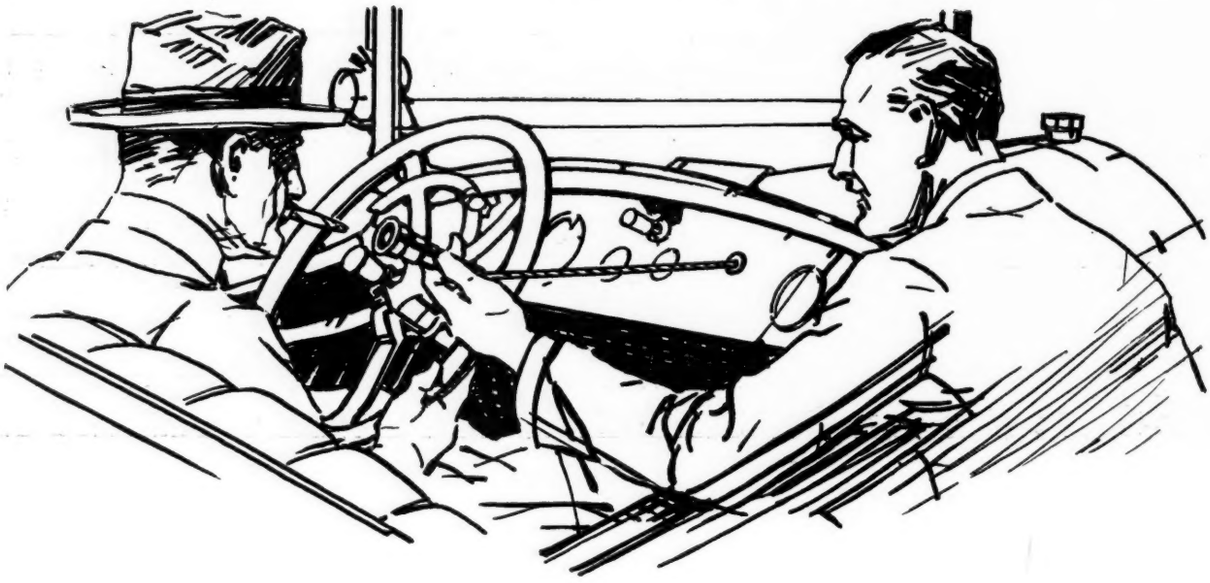

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Foreign Trade Turns Losses into Profits

Export shipments may consist of only 15 per cent of total volume, but they are essential to insure profit. Bankers must play more important role in promoting foreign business. Speakers at National Foreign Trade Convention are optimistic as to the future.

By David Beecroft

A MORE definite realization of the importance of foreign trade to any manufacturer, even though that manufacturer's foreign trade constitutes only 10 or 15 per cent of his business, was one of the major topics emphasized repeatedly by many of the leading speakers at the Ninth National Foreign Trade Convention, held in Philadelphia May 10-12 and attended by upward of 1500 delegates from all industries in all parts of the country.

For nine years the National Foreign Trade Council, under the leadership of James A. Farrell, president of the United States Steel Corp., supported by a majority of the big manufacturers of the country, has been emphasizing the importance of foreign trade and the necessity for American manufacturers engaging in it, even though the percentage of exports is small as compared with domestic consumption, but never before has there been such a note of intense earnestness and appreciation as this year.

The leading bankers of the country, and they were very generously represented, for the first time admitted that they had made many errors in connection with handling foreign trade affairs, but that they were organized as never before. Standardization of forms in connection with foreign trade has been carried out, and a world-wide campaign for the adoption of these forms is under way. Bankers in the Middle West were well represented, and they too are prepared to handle foreign trade as well as those in the seaports.

The bankers being so heavily involved in many factories that were expanded during the war, and now must be kept working at as high capacity as possible, if they are to show a profit, showed a realization of the fact that their work in foreign trade is much more essential than merely that of their clerical organization to handle remittances and documents. Leading bankers from New York, Philadelphia, Cleveland, St. Louis, Chicago and other cities showed a practical realization of a larger part that the banker must play. He must do his part in keeping the factories at a greater capacity, and he has realized that while a manufacturer may export but 10 per cent of his product, that very frequently this 10 per cent represents the difference between a distressing loss and a very comfortable profit in business.

James S. Alexander, president of the National Bank of Commerce of New York City, devoted considerable time to establishing this fact. He put it this way:

"By a process of reasoning, which we now know to be fallacious, it was argued in some quarters that America might recover a considerable degree of her prosperity irrespective of the conditions of our foreign trade. This view was held by many a year ago, but the fallacy of it has been seen and realized during the past year by many business houses.

"From 10 to 15 per cent is a fair average of our foreign trade, as compared with domestic trade. In other words, a manufacturer has 90 per cent of his product consumed in the domestic market and 10 per cent in the foreign market.

"The so-called smallness of this percentage has surprised many business men and has made them, in some instances, lukewarm toward foreign trade. A 5 to 10 per cent loss, according to this theory, might suggest that 95 to 90 per cent of total trade would be left. This is absurd, because it presupposes that the 95 to 90 per cent does not in any way depend on the 5 to 10 per cent export business.

"A percentage of itself means nothing until we raise the question as to how much of a percentage change is necessary to fundamentally alter business conditions.

"For example: The difference between the normal volume of business and the volume of business at the bottom of a depression is only 20 per cent, and the average reduction from normal business during the entire period of depression may be under 15 per cent. Variations in operating ratios of not more than 5 to 15 per cent in some lines of business may cover the range of ample profits down to important losses. In other words, a so-called small percentage means nothing until we can inquire into the effect of that change upon the fundamental course of modern business.

"The relation of small percentage changes in the volume of trade to business prosperity is one of first importance. A full understanding of it involves much more than the relation of domestic to foreign trade. It involves the very significant relation between changes in gross business and profits, the demoralizing effect of a relatively small surplus of stock on domestic prices and hence on profits, and the fact that a change in foreign trade representing only 5 per cent of total trade may mean a loss of 20 to 40 per cent of the trade of some important industries.

"The re-establishment of normal trade conditions in the United States and the saving of this tremendous investment in extended plants depend to a large degree upon the extension of our foreign trade."

No Isolation for America

A Pittsburgh banker, J. P. Holdsworth, of the Bank of Pittsburgh, established the same fact with regard to the essential character of foreign trade and its necessity in our industry, even if the percentage is not greater than 10 per cent of total production. Mr. Holdsworth is one who shared the general opinion of the convention that a policy of economic separateness for America is impracticable and indefensible. People favoring economic separateness generally advance the argument that at best our foreign market is not more than 10 to 15 per cent of our total production, and that since there is not enough liquid capital to finance Europe's needs and our own as yet undeveloped natural resources, it would be better to restrict our own capital to our own internal development. Admitting freely the dominating importance of domestic business and the urgency of adopting every sound measure to stimulate it to the utmost, it still remains true that foreign trade is an integral and essential element in our continued prosperity.

Here is how Mr. Holdsworth put it to his auditors:

"In all lines of production there is a portion varying from 10 to 20 per cent, the sale of which is necessary to the profitableness of the entire operation. Our productive capacity, greatly expanded during the war, is substantially in excess of normal consumption requirements of the domestic market.

"Thus far our farms and fields have produced each year more than we need at home. In 1921 the export of agricultural products totaled more than $2,000,000,000, or a little over 50 per cent of our entire export business.

"Normally over 60 per cent of our raw cotton is exported. Normally nearly 50 per cent of our tobacco crop is exported. Normally 15 to 25 per cent of our wheat is exported. In 1921 we exported 35 per cent of our wheat. We normally export 13 per cent of our dressed meats.

"As a result of our steady industrial expansion we had reached the stage, even before the war, where we were exporting each year $1,000,000,000 worth of manufactured products.

"In many industries it is now necessary to market abroad 20 to 30 per cent of the output in order that the works may be kept running and labor fully employed.

"It must be understood that if the 10 per cent of production that is sent abroad were shut off, domestic business could not continue upon a 90 per cent basis. In numerous industries this export of 10 per cent makes possible economies of large scale production and measures the difference between prosperity and dullness in the industry concerned as well as in other related industries.

"The fact should not be overlooked that behind every $1,000 export of merchandise there are various domestic transactions preliminary to exportation several times the value of the export itself."

The fact that we require imports for the sustenance of our people and the development of the country, while not new in export parlance, was emphasized by Mr. Holdsworth in his effort to establish another reason for the imperativeness of foreign trade. Each year we import $250,000,000 worth of coffee, which has become a necessity of life and which cannot be grown within our borders.

Each year we import $235,000,000 worth of sugar.

Each year we import $200,000,000 worth of silk.

Each year we import $200,000,000 worth of hides and skins.

Each year we import $26,000,000 worth of tea.

Each year we import $54,000,000 worth of cocoa.

This story of imports of essentials of life and industry could be continued.

The American manufacturer must keep steadily in mind the fundamental facts that to sell abroad we must buy abroad, or the reverse, to purchase abroad we must sell abroad.

An attitude of isolation of America from the world's perplexing economic problems is no longer possible. The rehabilitation of Europe and restoration of order in world trade depend in a large measure upon financial cooperation from America. Not only must we sell abroad and purchase products from abroad, but we must invest money in sound foreign securities.

Export Era at Hand

Julius H. Barnes, of Barnes-Ames Co., of New York, was one of the many delegates who believe that a sound and substantial future for America in foreign trade is at hand, and that the substantial increases in foreign trade in the last few months indicate what the future

has in store. He believes that the next era of trade revival, and particularly foreign trade, will be one of such extent and so long sustained that America as the world leader in industrial production will prosper as never before. Mr. Barnes is another believer in that school of business men who realize the importance of a 10 per cent export trade in its effect on factory production and domestic trade.

Here is how Mr. Barnes expressed it:

"We have seen in the past year the differing views of men of equal ability and sincerity as to the short road back to prosperous industry.

"One school has argued that the 90 per cent of home trade should be conserved and developed, without venturing too far into the troubled area of foreign commerce.

"The other school has argued that the 10 per cent of foreign trade was the balance wheel which ran our industries without the destructive over-production which would wreck it at home.

"Both schools would agree that the home market would be more secure if, without losses and undue risk, there could function also the surplus foreign trade production.

"I am sure there is general agreement that no cause contributed so directly to trade prostration in America and the resultant unemployment, which automatically further reduced the buying power of our people, than the agricultural depression which flowed from unprofitable farm prices. No influence has been the source of so much confidence in the stability of our present reviving trade as the fact that the economic position of agriculture has magically altered in the last six months, due to foreign trade in the form of agricultural exports. The fact that we export 60 per cent of cotton and that a year ago cotton was 9 cents per lb. and to-day is 17, is a part of the story. In wheat we normally export 25 per cent of our production, but it has been greatly in excess of this recently.

"We should always bear in mind that a small surplus of production over demand for consumption fixes the price of the entire amount produced.

"The problem, therefore, is to at least maintain the existing volume of export trade, even though for the moment the volume cannot be increased. This thought was expressed in the report of the Unemployment Conference held in Washington Oct. 11."

"The world to-day is practically bare of stocks of all commodities, whether necessities or luxuries. The world-wide enforcement of economy during the past two years has been a blessing.

"The markets of the world are recovering their buying power because of this economy.

"Because of reduction in prices, buyers throughout the world, who have been withholding, are now buying.

"Now is the time for us to exert our maximum effort for extension of our foreign trade.

"The domestic market can be most highly developed only when substantially all that our industry can produce under normal conditions can be sold. It is the export market that is the controlling factor in determining the prices of most of our agricultural products, those of which our farmers produce a surplus above domestic requirements.

"The defeatist who singles out American foreign trade as the important object of attack on the ground that it is of minor importance, as compared with our great home market, is singularly shortsighted."

James A. Farrell, president of the United States Steel Corporation, is to-day as optimistic and as enthusiastic on the possibilities of foreign trade as he has ever been, and for ten years has stood as a leader of the movement. Here is how he looks upon future trade possibilities:

Foreign Trade Essential to Maximum Development of Domestic Market

THE domestic market can be most highly developed only when substantially all that our industry can produce under normal conditions can be sold.

Those who think that our domestic market can be developed best with a minimum of foreign trade must realize that our industrial establishment has reached a stage where it can produce more than our domestic market can consume.

The calamity which overtook this country after the outbreak of the war was due to the almost complete suspension of our foreign trade, and that is why we are to-day concerned with an extension of banking and other facilities which will assist in finding international markets for our products.

Money is now migrating abroad in the form of loans at the rate of $1,500,000,000 annually.

The economic recovery of Germany is a world problem whose solution must be striven for without regard to sentiment or consideration.

There is no doubt that once Germany is put in a position to stabilize her exchange she will be on the road to economic recuperation.

We cannot maintain our hold upon foreign markets automatically, or count on keeping a favorable merchandising balance indefinitely without corresponding endeavor.

The American people, as a whole, must be brought to a clearer understanding of the vital relationships of foreign trade to their personal welfare. There must be a clear, general understanding of the fact that none of us can stand wholly alone. We all do and we must take something from and give something to our fellows and there must be developed among us a fuller realization that in helping others we are indirectly helping ourselves.

It is the export market that is the controlling factor in determining the price of most of our agricultural products, those of which our farmers produce a surplus above domestic requirements.

The greatest subsidy our ships can have in overseas trade would be the support of the American people. The greatest hardship under which they are at present laboring is the lack of such support.

JAMES A. FARRELL.

The depression that has existed in our export trade has been due not to the competition of Germany, Austria, France, Belgium or Great Britain, but to a world lack of purchasing power. German exports are only at 25 per cent of pre-war records and German production at approximately 70 per cent of 1913 production. Charles M. Muchnic, of the American Locomotive Sales Corp., not only believes that the lack of buying capacity throughout the world has been responsible for the depression, but that many of the European countries, particularly Germany, have made a serious error in connection with their currency. The real cause of German currency depreciation is not due to reparation payments exacted by the Allies but to false economic measures and theories indulged in by the German Government ever since the termination of the war.

The German Government has failed to impose adequate taxes and to collect such taxes after imposed. The government has erred in a criminal dissipation of its national wealth through the maintenance of a fictitious value of the mark and the granting of absurdly large subsidies. This applies to Austria and other central European countries.

Raw Materials Depleted

While the Germans had raw materials they were able to push their export trade, but they soon found themselves unable to replenish their stocks of raw materials required for further production of articles for export, and to-day many German manufacturers are unable to quote prices on export products and are endeavoring to sell on prices that may prevail at date of shipment. A show of hands from the convention floor indicated that many American manufacturers are getting orders that were formerly placed with German concerns but were cancelled because of the price situation.

It is now generally agreed that Germany and other central European countries have been victims of false political economists who advanced the theory that the country enjoying a low foreign exchange value of its currency, like Germany, is assured of ample employment for its labor and a larger field for its exports. This theory was believed in by many people in America and even by experts on the reparation commission.

Sober thoughts and the events of the past two years have shown the fallacy of this theory, but which is still widely believed in Germany. The imposition of the 26 per cent tax on German exports was, to a large extent, dictated by the British and French spheres of foreign competition.

The German Government has been slow in promulgating an adequate system of taxation, it has not imposed rigorous measures for collecting the taxes when imposed and has indulged in the most extravagant systems of subsidies that inevitably brought about the collapse of its currency.

Subsidies Cause Annual Deficits

It was, and to a large extent still is, the government that paid a very large proportion of the wages of the German workmen through subsidies on food supplies, through rent laws which made the owning of real estate a liability instead of an asset, through railway rates and passenger rates that converted a large pre-war revenue into billions of marks of deficit, through postal telegraph and telephone rates that mean billions of deficits annually.

These acts, added to the evasion of the payment of taxes, particularly by the large industrialists and capitalists who succeeded in transferring their fortunes abroad, have impoverished the German Government, and when the German manufacturer sells his products abroad for gold and leaves, say, 50 per cent of it on deposit and to his credit abroad, that 50 per cent represents the various government subsidies granted on food, rent, railway rates, etc.; it represents the savings of the great middle and professional classes of Germany and that which was in German Government securities or in trust and insurance companies.

Obviously such a situation cannot last indefinitely. The reserves are already exhausted or nearing exhaustion. The reparation commission realizing this, has demanded that the German Government abandon all subsidies, that it increase its postal, freight and passenger rates so that the receipts would at least balance the expenditures, that it discontinue the unlimited printing of money and institute other financial reforms, and that it separate the German Reichsbank from the government. If these measures are honestly carried out, it will put German production costs on a sounder and more natural basis that would be nearer our own, British or French cost of production.

That depreciated currency, when government subsidies are exhausted or eliminated, causes a rapid rise in wages and the cost of living is strikingly illustrated by the conditions in Austria during 1921, where the costs of practically everything is 50 to 100 per cent more than in Germany and nearly as costly as in London, Paris or New York. There are many leading bankers and business men in Germany who believe that Germany is only a matter of months behind Austria in its financial and economic tendencies. If this is correct, we can expect to see German manufacturing costs reach a more normal and sound gold basis.

There are three natural conclusions:

1. Money inflation and its consequent depression does not lower costs of production.
2. Depreciated currency is only a temporary factor in international competition. It will disappear when the reserves have been exhausted and government subsidies of every character materially reduced or entirely eliminated.
3. As a general disturbing element and destructor of values it has about reached its end.

Production Capacity Doubled

Germany during the war doubled her pre-war productive capacity, and with this increased facility the present German production is just under 70 per cent of her pre-war production, according to C. J. Warren, of the Remington Typewriter Co., who has recently returned from spending 8½ months in central and western Europe.

Mr. Warren has some very interesting information on general conditions in Germany.

There was more building going on in Germany than in any other European country visited. In Berlin three large banks were adding two or three stories. Most of the building was, however, of residential character.

There was less unemployment in Germany than in any other country. There was suffering among the people with fixed incomes, such as widows, old people, school teachers and others whose incomes had been increased but relatively little.

Last autumn the retail stores in Berlin had practically empty shelves. This was due to Germans deciding it was better to have anything on hand but marks, and hence they rushed to the stores and bought articles of all characters.

The large Berlin hotels were occupied almost exclusively by foreigners.

German exporters are pushing their wares more energetically in the countries of low exchange value than

elsewhere. While we are feeling German competition keenly in some markets, she is less able to supplant our foreign trade than she was before the serious drop in her exchange.

Labor is generally considered less efficient than formerly. Some of Germany's industries were so specialized that one process was finished near the coal fields. The partly finished goods were then transported to where there was a better water supply or to where the necessary chemicals were produced. In some cases the new frontiers have come in between the different units necessary for the completion of a given article. Delays occur in spite of all that can be done, which makes economical operation impossible in some plants and processes.

There are other difficulties which the German manufacturer has to face, export duties and ever-increasing taxes. Wages were increased at thirty-day intervals while the exchange was dropping, which is the reason for some German manufacturers only accepting orders subject to market price at time of shipment.

Formerly Germany drew many valuable supplies from Alsace-Lorraine and those parts of Silesia which she no longer controls. If she gets supplies from these sources to-day she does so in competition with others and not on any preferential basis. The lower her exchange drops the more difficult it is for her to buy raw materials.

For concerns considering the possibility of manufacturing in Germany it should be kept in mind that should the German exchange become stabilized or improved, prices of commodities will drop much more rapidly than will wages. Germany will then encounter the same difficulties which Great Britain has recently with the improvement of her exchange.

One of America's best authorities on exchange, Fred I. Kent, of the Bankers' Trust Co., New York City, analyzed ten factors that will help the exchange, provided they are worked out intelligently. They are:

1. Co-operation with Russia along lines aimed to reduce the menace of the Red Army.
2. Eliminate the menace of the vicious propaganda of its present rulers.
3. Obtain recognition of the rights of the Russian people to have a free press, a free expression of opinion, free elections of government officers and definite property rights.
4. A quick settlement of the German reparations with terms of payment compatible with existing conditions even though they recognize, as they should do, that Germany should pay a real penalty.
5. A cancellation after agreements as to co-operation of some percentage of the Inter-Allied loans that can fairly be estimated to represent a direct and legitimate war charge to the nations taking part in cancellation.
6. Reduction of governmental waste.
7. Stoppage of inflation caused by the issuance of new currency and increase in floating loans.
8. The removal of trade barriers by means of special commercial treaties and agreements between nations.
9. Greater co-operation between capital and labor so as to allow for the increase of production as rapidly as concurrent developing conditions enable its absorption.
10. A better world morale working toward the elimination of class and national hatreds and the increase of integrity and square dealing.

There are three principal factors that have worked together since the armistice to prevent the stabilization of the foreign exchanges around the gold points:

1. Unequal trade between nations
   (a) induced by the destruction of war, and
   (b) through the raising of barriers between the nations by their governments represented by tariffs, embargoes, etc.
2. Inflation.
3. Uncontrolled governmental expenditures exceeding income from all sources.

Persistent Sales Efforts Will Produce Results in Foreign Trade

IF business is dull at home, do we usually sit idly by and make large reductions in our sales efforts?

Rather, do we not study the various causes and effects of the conditions producing such a decline, and do we not apply ourselves to study them, and perhaps to modify our plans and methods, so that, if possible, we may combat the dullness and encourage buying in either old or in new lines?

If this is the feeling regarding home business, why should it be any different with business away from home?

My own conclusions are that it is only because we are not so familiar with oversea conditions and methods as we are with those in our own country. So far as I am able to discover, those larger exporters who have been operating abroad for years are not curtailing their efforts to promote business, for the reason that they have the experience behind them which leads them to believe that renewed and continuous efforts will, in the long run, produce business, and repay their efforts.

We will, of course, acknowledge that in some countries, by reason of their poor financial conditions, rapid returns may not be expected, and further, perhaps sales efforts are not worth considering at the moment, but we must remember that in spite of that fact, there are enough countries where business may be done to justify serious thought as well as serious effort.

We have been really spoiled during the war period by the ease with which we got business —buyers were hunting for materials from the United States, and terms were made by suppliers, which were onerous and dictatorial to buyers. I will not say some were not justified, but we are now operating under entirely different conditions.

We must modify our terms of sale, we must approach the buyer with an effort to meet his ideas of details as to shipping, as well as in arranging credits and in making quotations. Many of us are now doing this.

STANLEY G. FLAGG, JR.,
Stanley G. Flagg & Co.

Rising Tide of Automotive Exports Brings Out Importance of Foreign Trade

FEW lines of commerce were better represented than the automotive industry at the annual meeting of the National Foreign Trade Council, held in Philadelphia the three days ending May 12. Executives and export officials of the producing companies were uniformly optimistic concerning the revival of overseas demand and it was readily apparent that international shipments are again playing an important part in the manufacture of passenger cars, motor trucks, motorcycles, tires and other equipment. The increasing demand has reached such a character throughout the industry as to warrant an unqualified statement that it is analogous to the better situation prevailing in the domestic markets and is, indeed, an immediate reflection of improving business conditions throughout many parts of the world.

Numerous export officials of the automotive companies were in attendance at Philadelphia. In actual number, they were exceeded only by the banking, shipping, commission house and steel representatives who always form such large groups at general conventions like the one just held in Philadelphia. But no group was more thoroughly optimistic over the future of their export markets and no industry reported a similarly high comparison of present shipments with those of the peak periods of 1919 and 1920. In fact, it is possible—probable may be the more nearly correct word—that the 1922 shipments of automobiles to other countries will exceed those reached in 1919 and that the year's trade will reveal itself as the second largest in the history of the industry. This prediction seems warranted by the business already done, particularly in passenger cars, tires and equipment, and export officials expressed themselves as having little fear that later months of the year would see any slowing up of foreign demand.

General Betterment in Export Market

Practically every line of trade, of course, has undergone some betterment in the export market since the year turned. The steel demand has improved materially and textiles are moving in larger volume, just as are many other lines. But the automobile, with its attendant equipment, stands above practically all others as being an American product that has attained a commanding position throughout the civilized world and consequently has made a return to more nearly normal proportions. No competition worthy of other than passing interest, excepting perhaps in a few lines of equipment, has appeared to offer equal service in providing the transportation required in developing territories and in this respect the American automotive industry has very definitely placed itself above all others. The result of this leadership was taken to mean, by the executives at Philadelphia, that the present demand not only would continue but that it would grow from month to month as various countries emerge farther from the depression period.

The position of the automotive industry in the foreign markets had but little recognition in the set program of the Philadelphia convention and, therefore, it was not this part of the convention that holds the greatest interest. What will be of interest, however, is that the automotive representatives evidenced a changing feeling among company executives toward the necessity of cultivating and working more actively for the upbuilding of their international trade. This feeling was lacking in previous years. No more than twelve months ago, only here and there in the industry could be found a belief that the export trade in automobiles would survive the depression period short of two, three or four years. In 1919 and 1920, for instance, a negligible percentage of production was alloted to the overseas representatives; to-day, the companies have taken a more "favoring spirit" toward foreign trade and the export official—particularly of the more important lines—has been strengthened materially. This is a healthy sign, as it means a recognition of the value of foreign selling in keeping production up to better levels, throughout the entire year.

Nevertheless, the "favoring spirit" is not everywhere in evidence. Some export officials already are finding it difficult to get shipment on their orders but there was a feeling evident that a bigger proportion of the output would be so allotted. This was not true in 1919 and early 1920. Export orders came into the factories in large volume, but in many instances they were subordinated to other calls and few export departments filled anything like the orders that came to them.

Dealers the Biggest Problem

Dealer representation is one of the biggest problems confronting the exporter, practically every one of the officials at Philadelphia saying that more adequate distribution was needed. One of the larger companies, whose line ranks it among the first three or four producers, shipped in March, April and early May at a rate equal to 80 per cent of its peak in 1920. This company, like others, needs additional dealers and is appointing them under their distributors in the various countries. A third company, with a smaller output, made a much similar report, and while its dealer connections are satisfactory in many districts, its export representative feels that many territories are yet uncovered. This is typical, affecting practically every sort of automotive equipment.

The car and tire companies have been the first to be affected by the rising demand and they are, of course, doing the most to cultivate the overseas markets. The tire makers are keenly alive to foreign possibilities and are pushing their products with much vigor. This is in contrast with other automotive lines, notably accessories and equipment and, to a smaller extent, trucks.

Financing and credit arrangements as regards foreign shipments also form a subject that has drawn close attention from the industry. The banking and financial group meeting at the Philadelphia convention was attended by practically all automotive representatives in attendance and each listened closely to the exposition covering the use of bankers' acceptances in export trading. The bankers, they learned, are still scrutinizing every foreign credit with very watchful eyes and are frowning upon too liberal grants on overseas shipments. But a great deal of progress has been made in setting the financial field into more stability, so that this problem is not nearly so acute as it was only a few months ago. Exchange values have increased from 10 to 50 per cent in the important buying territories within the last six or twelve months and, excepting for Europe, further betterment is generally predicted by the various bank representatives who attended the convention.

What Should Be the Weight Limit for Trucks Operating on Highways?

Highway official says 10 tons, truck operator says 15 tons. Committee appointed to study this problem by the National Highway Traffic Association recommends at its annual meeting, that the maximum be set at 14 tons. Other reports dealt with the railroads as operators of highway transport, highway transport clearing houses and highway construction.

THAT highway officials are not all agreed upon maximum axle loads of 22,000 lb. or maximum truck axle loads, was well established at the annual meeting of the National Highway Traffic Association, held in New York City, May 12, when James W. Synan, Assistant Associate Commissioner, Division of Highways of Massachusetts, announced that his State was not agreed as to the permissible motor truck load and that for the purposes of creating discussion throughout the State the Division of Highways was anticipating announcing that the maximum gross weight of trucks of 10 tons only might be desirable on their highways. His reason was that Massachusetts cannot see where the money is coming from to continue building her highways as it seems necessary, and he announced that in another year something drastic might be expected by way of limitation of gross truck load, or increase in registration fees from the Commonwealth of Massachusetts. He suggested the fact that he considered the motor truck industry rich beyond comparison, and quite capable of paying the bills.

An attack of this character furnished an excellent opportunity for George H. Pride, treasurer of the National Highway Traffic Association, and president of the Heavy Haulage Co., New York City, who placed before Associate Commissioner Synan a saner view of the truck situation. The reason for the heavy truck rests with the community which eventually pays the bills of highway transportation. If smaller trucks were employed the cost of transportation would increase and such loss through inefficient transportation service would be paid by the consumer of all commodities within the community.

Mr. Pride struck a keynote of community transportation when he declared that the duty of highway officials is a much broader one than merely that of deciding on some type of highway and constructing it. Their work is one of the most economical transportation in the community, and roadbed and truck weights must contribute to this end. The public must not be penalized by payment of higher costs on transportation solely because a highway commissioner fails to see where the money is coming from. The community must understand that it makes little difference at the end of the year whether the money is paid direct for highway construction or if it is paid in the added cost of every commodity used in the household and in industry because of increased transportation charges. The broader view of the highway commissioner which considers the problem of transportation is the one that must be kept in mind.

HIGHWAY transportation in all its many phases is of vital interest to the truck manufacturer. Study must be carried on with a broad understanding of the interests of all groups, the highway engineers, highway authorities, railroads and the general public.

A complete understanding must be brought about between these interested parties if we are to secure harmony of operation. Without this harmony there will be a constant impediment in the way of steady progress and stabilizing of our whole transportation system.

Research must be carried on before we can have a final solution to the problem of highway transportation and a concerted action by all on the findings of this research. Those who wish to see the progress of motor truck transportation can, and must, view the problem in its broadest aspect and lend whatever assistance is within their ability.

The attack by Associate Commissioner Synan came as a result of a committee report made by Mr. Pride on Regulations Covering Speeds, Weights and Dimensions of Motor Trucks and Trailers.

The recommendations for regulation of motor trucks were as follows: maximum width 96 in., maximum height 12 ft. 6 in. and maximum length 30 ft. The maximum load per inch of solid tire was recommended to be set at 800 lb. The only regulations regarding trailers was that they should not weave when in motion. Maximum loads were recommended to be set at 22,000 lb. The following suggestions were made in regard to vehicle speed:

Weight in lbs.	Speed in m.p.h. Ordinary roads	City
4,000	25	20
8,000	20	20
12,000	20	15
16,000	15	15
20,000	15	15
24,000	15	15
28,000	15	15

The committee also reported that they found that pneumatic tires wore down roads quite as much as solids owing to their increased speed and in the case of some macadam and gravel even more.

Rialroads in America should, and undoubtedly will, purchase motor trucks in great numbers to supplement their existent service, and in this way following the ex-

ample set by British railways, said Arthur H. Blanchard, in charge of highway engineering of the University of Michigan, and president of the National Highway Traffic Association, will do a useful work for highway transport.

The present attitude of railway officials is not simple. Some of them have appreciated the value of highway transport and have collaborated with the existing agencies. They have also recognized, in many cases, the economic necessity of motor transport as a feeder to the railways. Other officials have been against highway transport and have endeavored to curtail development through legislative procedure and have advocated curtailment of highway improvement. As a matter of fact they can do good by helping highway improvement.

He also stated that the motor truck can help solve congestion at terminals and the short-haul problem. Some of the uses to which the railroads can put trucks are:

1. Inter-terminal transportation.
2. Intra-terminal freight yard transportation.
3. Collecting and delivery of freight—store to door delivery.

In regard to present attitude and laws Mr. Blanchard says: "One should realize that laws of the product of the mind change rapidly."

Expansion of Railroads Through Trucks

Of the opportunity for expansion which the motor truck offers the railroads, he says, that urban and interurban lines may be expanded; steam railways may utilize trucks to increase passenger and freight service and railways having scenic lines may supplement them. In respect to these latter two, England furnishes a very good example. Rail cars are the logical solution to nonpaying short lines and even these may have to be discontinued and busses utilized.

He believes that the railroads have some economic advantages in that they have already established traffic and maintenance departments, and in many cases idle real estate and buildings which can be used to house motor trucks and busses. In the future we may expect to see railroads using trucks to supplement their work and this may be carried further to their using their own motor lines. Again they may seek to eliminate competition by means of franchises or cutthroat methods. In closing Mr. Blanchard urged that all elements; electric and steam railway men and all parties who are connected with transportation should be included within the Association to guard against this danger from franchises when the Legislature meets in 1923.

A series of constructive resolutions designed not only to expedite highway traffic but make it much safer, was presented by H. Eltinge Breed, highway engineer of New York City, who as chairman of the committee that considered this subject, presented recommendations on banking of curves, elimination of all signs on the highway, excepting those for direction and danger; and recommended marking the center of the roadway with a visible line on curves, and also sudden rises on grades where they approach the danger point at the summit.

Safety Measures

The resolution includes the standard distance of 500 ft. for posting railroad signs and other points of danger. The resolutions would make it a misdemeanor for one motor vehicle to attempt to pass another on a sightless curve, where the unobstructed line of vision is less than 500 ft. Mr. Breed recommended in addition banking of approximately 1 in. per ft. of road width on curves of 20 deg. or shorter, that is, a curve of 280 ft. radius, that the earth slope on the inner edge of the highway should be carried on a 4 to 1 grade. Recommendations included standardizing the shoulder on highways, making them 2 ft. wide and 4 in. deep where they meet the highway, and using coarse gravel. Because of the greatly increasing number of railroad accidents at grade crossings it was recommended that highway departments set aside a definite sum each year to create a fund for the elimination of grade crossings.

Favors Two-Lane Highways

For a year a committee of the National Highway Traffic Association has been making studies in the Detroit zone on traffic capacity, and widths of highways outside of municipalities, this work being in charge of Herschel C. Smith, Assistant Professor of Highway Engineering, University of Michigan. The research had to do with the desirability of two-lane, three-lane and possibly four-lane highways. Recommendations were that three-lane highways increased the number of accidents and should be discouraged. The results of uniform speeds showed that the capacity of a highway is, to a very great extent, dependent on speed.

To carry on experiments on this subject a condition was taken wherein on a two-lane highway 750 vehicles passed every hour, 500 of them in one direction. An assumption in variations in speed was made as follows:

3 per cent travelled at 3 m.p.h.
10 " " " " 10 "
57 " " " " 20 "
30 " " " " 30 "

In the second case the following assumption was made:

13 per cent travelled at 10 m.p.h.
57 " " " " 20 "
30 " " " " 30 "

In the last case assumptions were

13 per cent travelled at 10 m.p.h.
87 " " " " 20 "

The results of these three experiments showed that the meeting of slow-going vehicles caused such congestion that in the first case the traffic could not be handled on a two-lane highway; in the second case it was possible and in the third case it was possible to increase the number of vehicles using one road.

Mr. Smith's conclusions were that the design of roadways must seriously consider variations in speed, also that:

Two-lane highways must be 20 ft. wide and have 5-ft. shoulders capable of sustaining heavy loads.

That where speed of vehicles is reduced by slow-moving vehicles two lanes should be increased to four if the economic loss of time justifies the expenditure.

And lastly, that the building of three-lane highways should be discouraged.

Designate Highways by Numbers

The designating of highways by numbers placed on telegraph, telephone or other poles, instead of by a series of different colored bands painted around the poles, or by other methods, was recommended by the National Highway Traffic Association. Such a method of designation has been adopted in New England in which highways running north and south are designated by even numbers, such as 2, 4, 6, 8 or 500, and those running east and west by odd numbers, such as 1, 7, 333, 99, etc. This plan had its inception in the fact that the use of painted bands has passed its point of usefulness, owing to the difficulty of color combinations and confusion.

Under the number system it is planned for a highway for example, from Quebec to Miami, Fla., to be known as No. 2, or perhaps No. 10, or any other even number

throughout its length. The same would apply to transcontinental highways running east and west. The Yellowstone Trail might be No. 1, or the Lincoln Highway No. 1864.

There is a possibility that this plan will be pretty generally considered. New York State has practically accepted it, and plans are to be presented to all of the states.

Other reports were presented at the meeting. Thomas Snyder, secretary of the National Association of Commercial Haulers, Indianapolis, Ind., gave a comprehensive report on the motor clearing house system of Indianapolis. F. W. Fenn, secretary, National Motor Truck Committee, New York City, presented a report on state regulations concerning motor vehicles as common carriers. Dr. Hatt, director of Highway Research, Division of Highway Engineering, National Research Council, Washington, D. C., gave a report on his highway research work.

The delegates and members were welcomed to New York by Col. Arthur Woods, president of the Automobile Club of America, where the annual meeting was held.

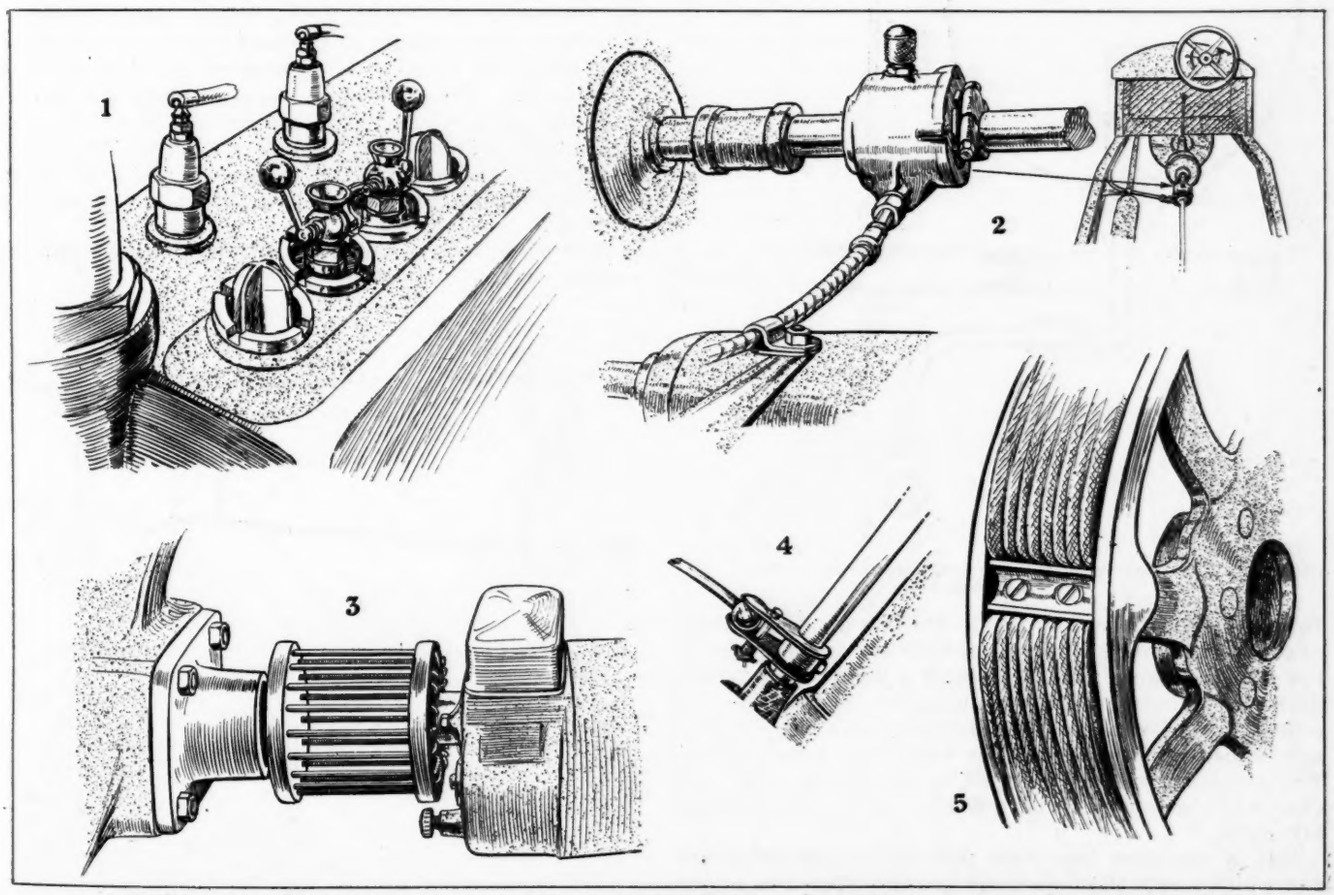
Precision in Weighing

PERFECTION of a standard of measurement to such a degree of accuracy as to immediately detect the withdrawal of a single steel rivet from an ocean steamship with a displacement of 25,000 tons, is the accomplishment of the Bureau of Standards of the Department of Commerce, it was learned to-day. The Department of Commerce says that this represents the most precise work of the kind done by the Bureau of Standards in many years.

In an item entitled "Comparison of Standards of Mass," the Bureau of Standards in its monthly Technical News Bulletin says that comparisons have just been completed between certain high grade standards of that Bureau with the "National Standards." The National Standards are small cylinders made of an alloy of platinum and iridium and are the standards for every weight used in the United States. In intercomparing these standards or when comparing them with other weights, a balance which will give results of almost unbelievable accuracy is employed. The accuracy of the results are well within 2 parts in 100,000,000, that is, in comparing two kilogram or pound weights, differences as small as 0.02 of a milogram, or one part in 1,000,000, can be detected.

IN 1919 China's motor imports had a total value of $3,750,000 (at par) and about 95 per cent of the total number were American cars. In 1920, 987 out of 1,320 imported cars in Shanghai were American, 188 from Canada, 111 British, 19 from France, and two from Italy. For the first two months of this year the British proportion showed a distinct improvement.

Engineering Details of Some Recent European Cars



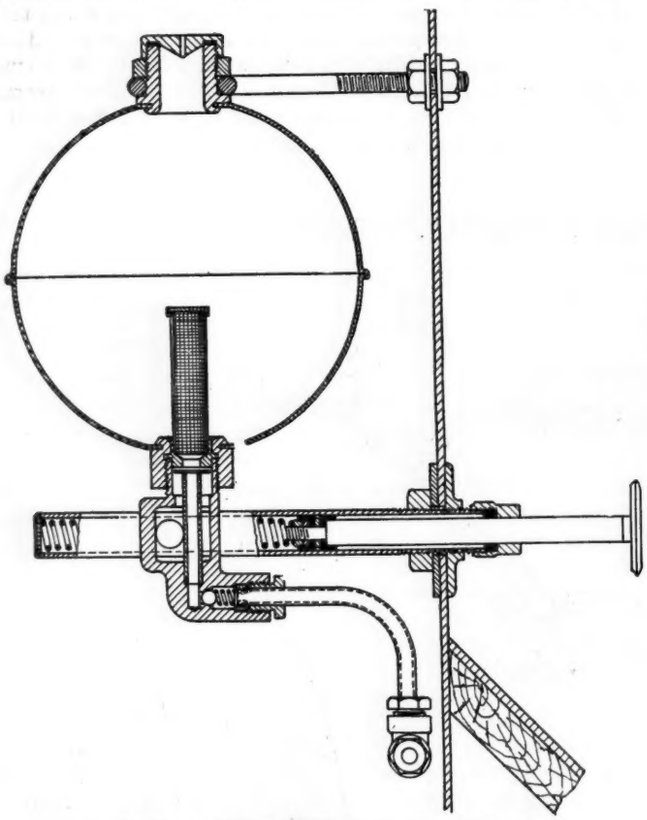
1—Position of spark plugs and valve caps with aluminum radiators in detachable head of new Turner engine. 2—Ansaldo skew gear speedometer drive for an open propeller shaft. 3—Lorraine-Dietrich squirrel cage universal coupling for accessory drive. 4—Lorraine-Dietrich control rod ball joint. 5—Jewett cone clutch with asbestos fabric cord for facing

Improved Distribution Given by Centralized Oiling System

Correct amount of oil to be fed to each bearing is regulated. Over-oiling troubles minimized. This system takes care of all chassis bearing surfaces.

A CENTRALIZED oiling system, in which a small tank with an integral pump located behind the dash or some other convenient place on the car is used to take care of the chassis bearing surfaces, is being put out by the Kellogg Manufacturing Co. The device is known as the Bloom chassis oiler and will be marketed under the O-K trade-mark.

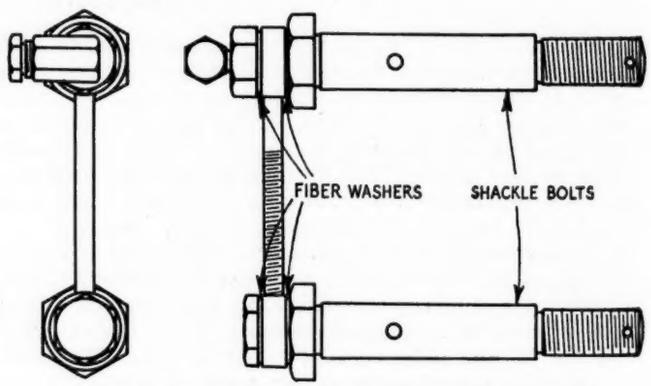
The small tank in a typical installation is of spherical shape, with a capacity of 1 quart of oil. The integral plunger pump mounted in connection with it is operated



1—Sectional view through tank and pump of the Bloom chassis oiler

from the driver's seat by hand. Pulling out the plunger draws a supply of oil into a chamber and pushing out on the plunger forces the oil through a lead which divides into two main pipe lines running down the frame on either side of the car. From these main supply lines are tapped off other leads for each part requiring oil. The pipes are rigidly clamped to the frame, and with one or two exceptions where flexible tubing is employed, are rigid.

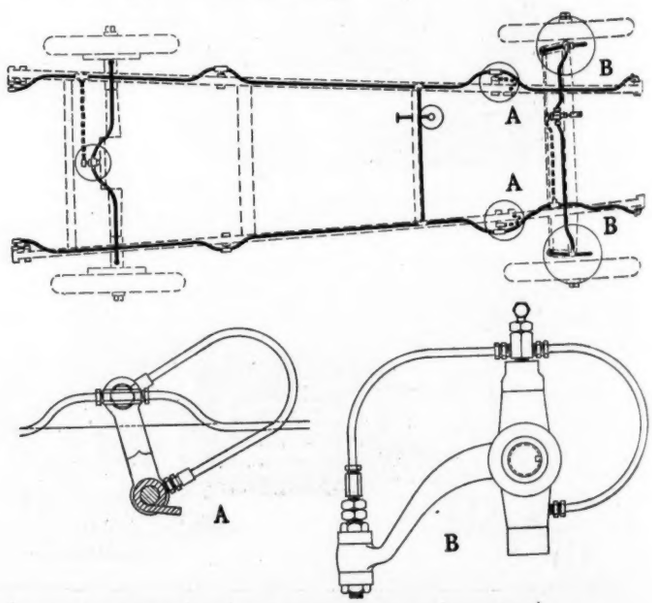
One of the most important features of the outfit and one which meets the objections usually offered to a centralized system is the method employed of damming up the various connections, leaving only a small hole for the



3—Oil connections for shackle bolts showing method of carrying oil to both bolts with one oil connection

oil to go into each bearing. Just before the point of oil distribution a small disk is introduced into the feed line, this disk being pierced with a hole which is proportioned to the amount of oil required for that particular bearing. With this device the oil in the feed pipe is so distributed that when the pressure is applied the oil is forced into all bearings. The connections are also equipped with these reducing plugs which reduce the amount of oil to be fed to bearings which do not require so much. The various connections are standard, all threads being ⅛ in. Briggs standard pipe thread and all connections for ¼ in. O. D. tubing.

It is possible to install the tank and plunger pump in a variety of positions about the car.



2—Installation of the Bloom chassis oiler on the Hudson super-six and Essex. Details of installation enlarged

How to Make Better Bearing Pressure Diagrams

Smooth curved lines connecting points on such a diagram give a more nearly true picture of the bearing pressures than do the straight lines usually employed. The reasons for this are given here in brief.

By P. M. Heldt

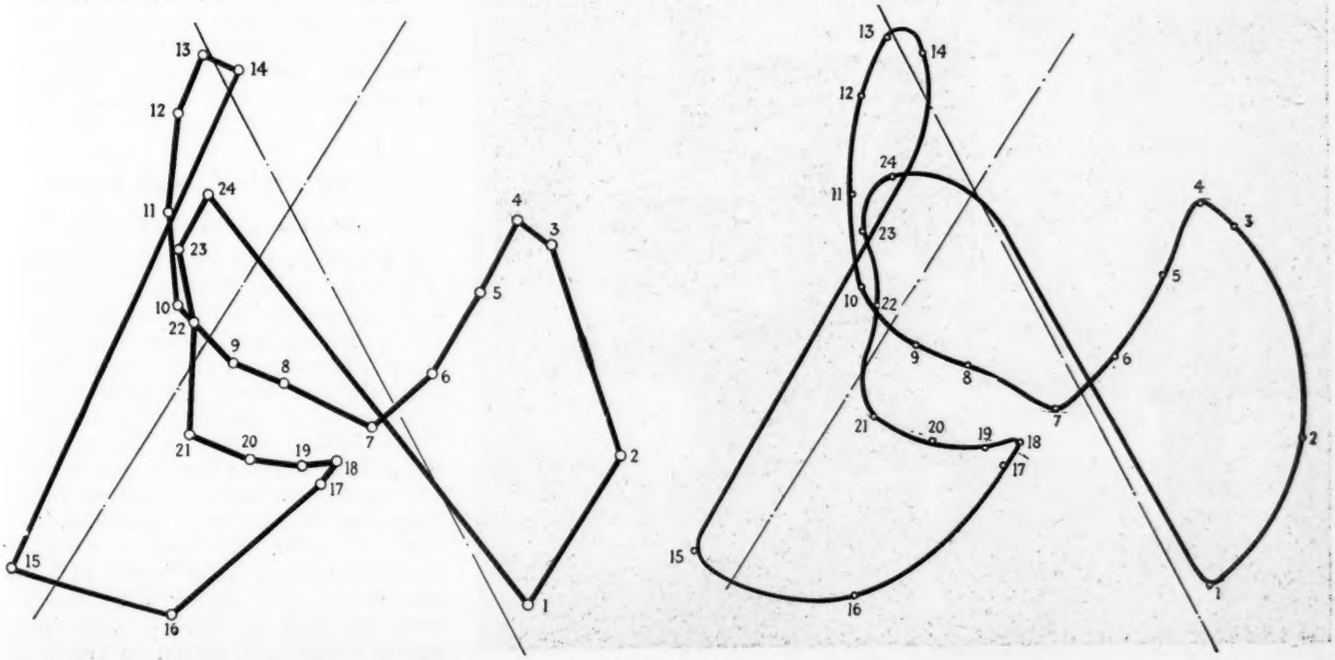
THE analytical investigation of forces and stresses in gasoline engines is constantly being extended and more exact views of the working conditions of their parts are being obtained. A marked step in advance in this connection was the introduction of bearing pressure diagrams in the construction of which account is taken of gas pressures, inertia forces and centrifugal forces. We believe that this form of diagram was first prepared some years ago by Otto Burkhardt of the Pierce-Arrow company for the purpose of making comparisons between six cylinder and eight cylinder engines and six cylinder and twelve cylinder engines with regard to relative bearing loads.

Mr. Burkhardt calculated the resultant pressures for twenty four equi-distant points on the cycle, plotted these pressures on a polar diagram, and connected the points found by straight lines. This custom has since been followed by others. This gives a rather rugged form of diagram which certainly does not accord closely with the actual variations of the bearing pressures. The diagram makes it appear as though there was a more or less abrupt change in the rate of increase or decrease of the bearing load at nearly all of the twenty-four calculated points.

As a matter of fact, the pressure on the crankpin varies fairly uniformly except at the moments of explosion. Perhaps the greatest error introduced by the practice of connecting the calculated points by straight lines is between points 24 and 1. Point 24 denotes a point on the cycle 30 deg. ahead of the top dead center at the beginning of the explosion stroke, while 1 denotes the dead center position. If these two points are connected by a straight line it makes it appear that the explosion began 30 deg. ahead of dead center and the rise in pressure proceeded uniformly to dead center, at which time combustion was completed and the maximum pressure attained. This hardly accords with the indications of a cylinder diagram.

The writer believes that for the most accurate picture of the bearing pressures the points on the diagram plotted from the calculated values should be connected by smooth curved lines, so as to give as nearly as possible a continuously variable or smooth curve. This is illustrated by the diagram below.

While completing the diagram, the laws governing the changes of the various component forces should be kept in mind. Thus at the time of explosion there is a quite sudden change in the value of the bearing pressure. The total amount of this change is fairly well known from the calculated values for points 24 and 1. In drawing the connecting line between these two points it should be borne in mind that it takes some time for the full pressure to be developed and that the whole of the pressure does not come on instantly. Moreover, the period of pressure



Bearing pressure diagrams with points connected by straight and curved lines

growth is certainly not located midway between points 24 and 1 but is very close to point 1. Thus the line of pressure rise should not absolutely parallel the cylinder center line but make a slight angle with it, this angle representing the time required for the completion of the combustion process. This swing into this line should be more gradual than the swing out of it, because just previous to ignition the pressure in the cylinder has been increasing for some time owing to the compression, whereas when the combustion is completed there is a very rapid drop in the pressure due to the expansion and the cooling effect.

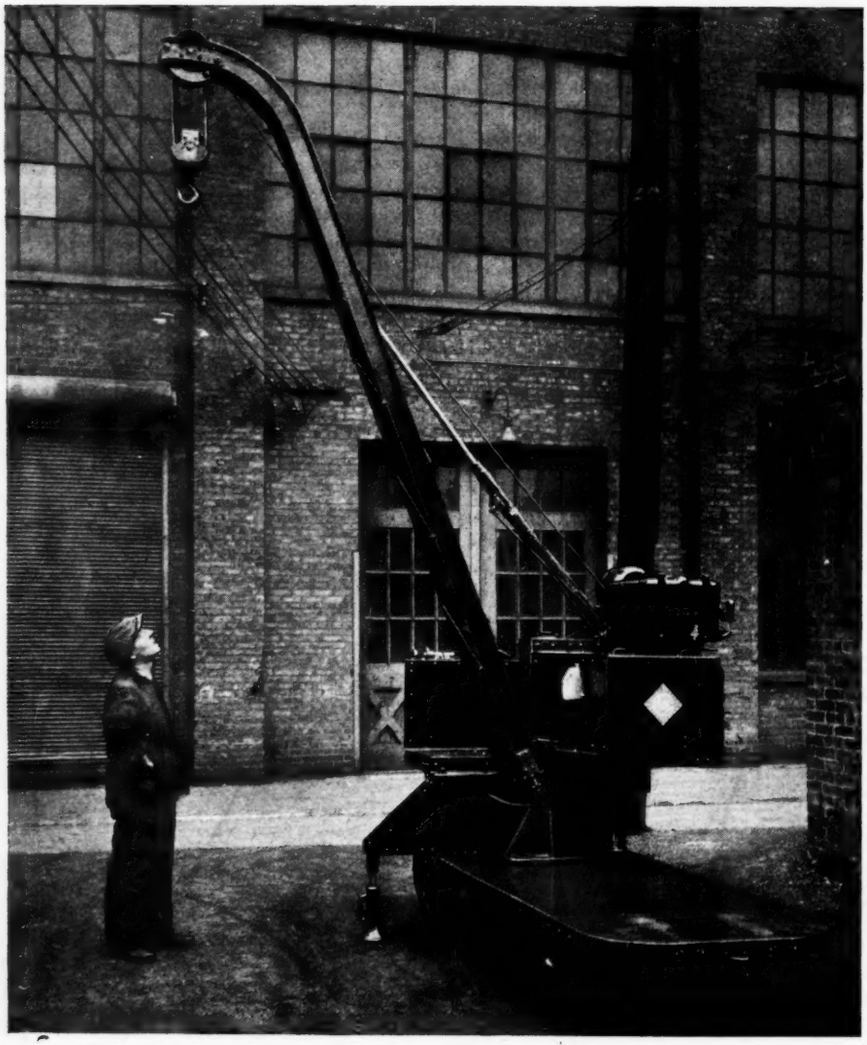
The difference in a bearing pressure curve constructed along these lines, as compared with one in which the points plotted from the calculated values are connected by straight lines, may be seen from the diagrams herewith. Both of these diagrams represent the same results. Of course, it cannot be claimed that the curved line diagram will fall together absolutely with points based on calculated values intermediate between those plotted, but it will certainly be closer to these values than the corresponding points on the straight line diagram. Moreover, the curved line diagram appears a good deal simpler and clearer to the eye. The writer realizes that, since the maximum pressures and the general distribution of pressure indicated by the diagram are not changed by the proposed method of drawing it, there are no very serious errors in the straight line diagram, but the curved line diagram is more accurate and as it can be drawn with hardly any more effort, it is preferable.

Portable Crane for Factory Use

HANDLING of heavy material or equipment in and about the factory is often greatly facilitated by the use of a portable crane. The Elwell-Parker Electric Co. is now marketing such a crane, same being mounted on truck which is equipped with a storage battery and motors which not only propel the truck but furnish power for operating the crane. A heavy vertical column with long bearings in the steel pedestal bolted to the truck platform supports the 12-ft. boom. The latter can be racked in and out by the operator without his leaving the position which he occupies when operating the truck. The hoist is operated by a separate motor connected direct to the hoist mechanism, the controller being located on the dash. The battery and motor are mounted on a steel frame in such position as to counterbalance the boom and its load. A special trip switch mounted on the front of battery box stops the inward motion of boom.

The crane is said to be capable of handling loads up to 3000 lb. It will pick up 1000 lb. at 8-ft. outreach at side or end of platform, or with outriggers as shown in position, will lift 3000 lb. at 6-ft. outreach. The boom can be lowered to permit entrance of doorways. The outriggers are quickly adjusted or folded and swung in beside the crane column when not in use. The truck is equipped with 21½ x 3½-in. drive wheels and 15 x 3½-in. trailing wheels, all four of which steer. Large wheels permit use in yards. A coupler is furnished on rear to permit the use of the unit for intermittent tractor service.

The inclosed E.-P. motors, differential worms, wheels and crane pillar column are all fitted with ball bearings. The single battery furnishes power to propel truck as well as operate crane.



The Elwell-Parker portable factory crane mounted on self-propelled truck

Artificial Wood from Refuse Materials

A RECENT invention of an artificial composition of interest to automobile bodymakers is reported from Australia. The material, which is similar to veneer, is produced from waste fibrous products and other vegetable matter, sawdust being used for the manufacture of cheap grades of the composition. It is claimed that it can be used for various purposes, including furniture veneers and wall panelling, and can be made to produce excellent marbling effects. It is capable of being bent easily for a variety of commercial purposes, can be worked with tools, sawed, bored and planed as freely as wood and takes nails or screws readily.

Are Cables Superior to Rods for Brake Couplings?

European makers think they are. It is claimed that cables are stronger for a given weight and less liable to sudden failure. Disagreement exists as to relative cost. Sunbeam, Minerva, Ansaldo, Lorraine-Dietrich and La Licorne furnish some excellent examples of current practice.

By M. W. Bourdon

IN a large number of post-war European chassis the designers have reverted to the use of cable couplings for rear wheel brakes, and in some cases cables are used also for transmission brakes. This step evidently was not taken merely to avoid a multiplicity of rods and prevent the possibility of rattle where pairs of rods must run back side by side and adjacent.

Cables have not been readopted to simplify the means of compensation, for in quite a number of examples no compensating arrangement is provided, the same as in 50 per cent of chassis where rods are retained. In isolated cases the cable runs from one wheel brake to the other through the cross tube from which the levers depend, providing compensation by the freedom of the cable to move axially in the tube and through the lever eyes. In one instance (Sunbeam) this arrangement is modified to afford adjustment; the cable as it passes across the chassis alongside the cross tube is divided and the ends are secured to lugs which can be varied as to their distance apart by a milled disk on a left-and-right-hand threaded coupling. In another case, where all the brakes are on the wheels, the two cross-shafts are fixed, and on the driver's side each carries a double-ended rocking lever, from the upper end of which a cable runs forward, passes round a roller attached to hand lever or pedal and then runs back to another lever on the end of a sleeve surrounding the cross-shaft; from a lever on the other end of the sleeve and from the lower end of the rocking lever single cables run to the brake camshaft levers. Thus the compensating device is in the first-motion coupling. (See Fig. 1.)

Function of Cables

Generally speaking, the cables do nothing more than is asked of rods, i. e., form a coupling between two levers; further, they are rarely provided with any direct means of adjustment other than the clips which form their anchorages. This, again, is merely following a tendency in connection with rods, for the internal expanding shoes of quite a number of European rear wheel brakes have no means of adjustment behind the finger nut at one end or the other of the single coupling rod from the hand lever to the cross tube; the shoes are of such dimensions and the cam or toggle between them is so designed as to provide the levers with a full range for wear, and when the lever angles become excessive the need for the renewal of friction surfaces is made evident.

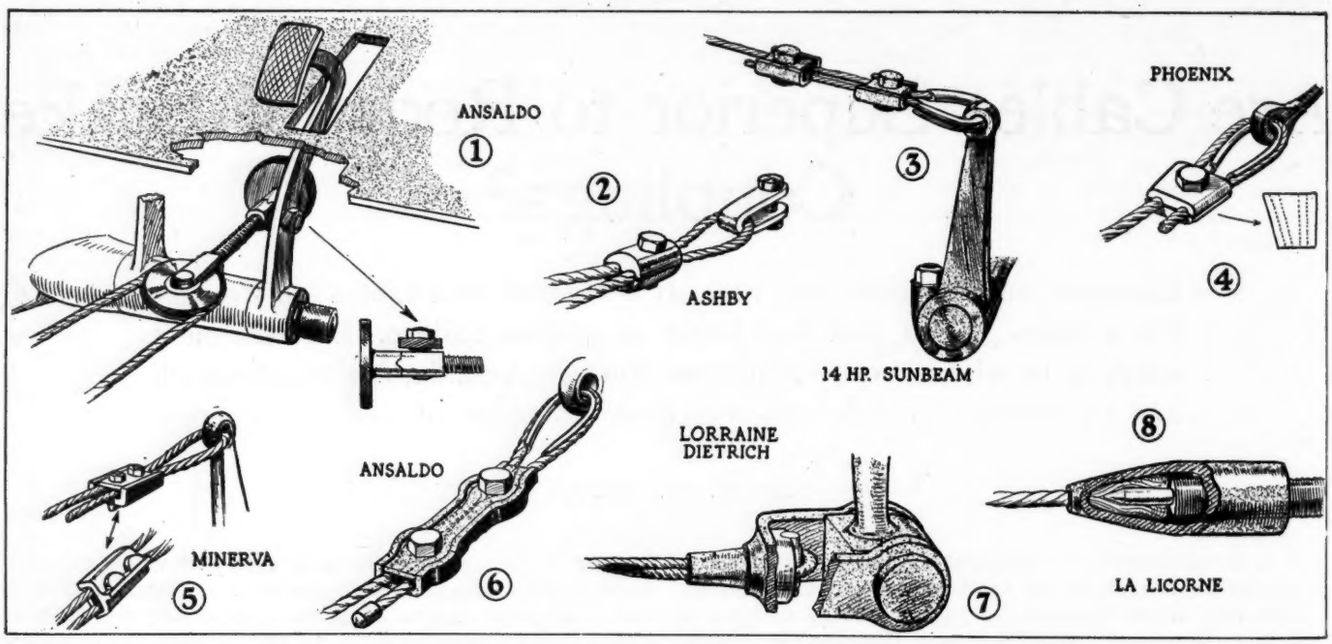
But primarily this reference to cable couplings for brakes is to indicate some of the various means of anchoring the ends of the cables to their operating and operated levers. The simplest arrangement now in use is very similar to that common in early days and which was discarded mainly because adjustment as to length was difficult and other means of brake adjustment were either unsatisfactory or non-existent. Two present-day examples of cable clips are seen in Figs. 2 and 3. In that shown in Fig. 3, which is found on the new 14-hp. Sunbeam, a pair of U-shaped pressings with a flat clamping plate and bolt are used, while the cable is kept from chafing and from assuming too sharp a bend where it passes through the lever eye by a horseshoe-shaped piece of channel steel. No such provision is made in the case of Fig. 1, where a pair of grooved stampings form the clip and the cable passes through a U coupling piece; the latter is made from flat stock, and its natural tendency to assume a curved inner surface when bent over so sharply is depended upon to prevent the cable being bent round two right-angled corners; but obviously this arrangement is too crude to be satisfactory, and the cable will certainly be cut in course of time where it makes contact with the corners of the coupling piece.

To Obtain Straight Line Pull

With either of the clips shown in Figs. 2 and 3 the cable is bent more or less where it enters the clip adjacent to the lever eye. To overcome this and to give a straight-line pull from the lever, the grooves in the clip shown in Fig. 4 are not parallel with one another; one is at right angles to the ends of the clip, and it is in this groove in which the "long side" of the cable is intended to lie, the short side lying in the other groove and both entering the clip without being kinked. This is a refinement of very small magnitude attained without additional cost; but the chances are even that when the driver removes the clip at any time he will replace it the wrong way round and make the kink on the long side even more pronounced than it would be if the grooves were parallel.

In Fig. 5 is shown the Minerva clip. It is a parallel-sided stamping with a flat pinch-plate and two bolts; under the U is a flange out of center to form an abutment for the D heads of the bolts and prevent them from turning when their nuts are tightened. Beyond this consideration for the user or assembler there is nothing out of the ordinary in this example. The Ansaldo clip (Fig. 6) has two bulges in line with the boltholes, which have the effect of kinking the cable at both sides and assisting the bolts to discourage the cable from pulling through the clip; the sleeve soldered to the short end is merely to prevent fraying.

An expensive fitting, hardly justifying its cost, but one which will, nevertheless, suggest variations of the same



Examples of European practice in use of cable couplings for rear wheel brakes

principle attainable at a lower cost is that of the Lorraine-Dietrich (Fig. 7). The sketch is self-explanatory up to a point; beyond that it should be said that the boss through which the looped cable passes within the U coupling on the lever end is a separate unit. The pin which passes through the loop takes the pull from the cable and is prevented from falling out of place when the pull is released by being shouldered and by the ends of the cable being soldered together and to the U coupling where they leave the latter.

The sketch, Fig. 8 (La Licorne), is reminiscent of certain ignition cable terminals, a taper-ended plug screwing into a tapered sleeve, where it spreads and binds the strands of the cable end. Although not shown in the sketch, it should be said that the outer extremity of the threaded plug has an eye to secure it by means of a pin to the operating lever. This arrangement removes one of the chief advantages of cables for brake couplings, in that it reintroduces dependence upon screw threads to take the direct pull of brake actuation, though admittedly there are not the potentialities for wear of the threads that exist where a rod is used. But it should be easy to remove this shortcoming entirely in a fitting embodying a taper spreader by making the eye—or a double eye—integral with the outer sleeve; such an arrangement would then represent probably the best and cheapest of those now used.

As to the points for and against the use of cables in lieu of rods, it is claimed that they are stronger for a given weight, less liable to sudden failure, discourage rattles, lend themselves readily to compensation if required and in some cases tend to reduce cost, though on the latter point there is considerable divergence of opinion. The cables are, of course, twisted from hard steel strands and are galvanized. They are, it would seem, not objected to by European buyers of cars.

Market for Spark Plugs in Czechoslovakia Supplied by Germany

THERE is a considerable demand for spark plugs in the consular district of Prague, Czechoslovakia, according to a report from the United States Consul. This demand is met almost entirely by the Bosch and Eisemann manufacturers, the former having a branch office in this city and the latter a representative only. Spark plugs are imported mainly from Germany, a very insignificant supply being imported from France and England.

The trade names of the principal spark plugs sold are "Bosch" and "Eisemann," being German makes. Other German makes sold are the "Meah," "Beru," "Siemens," and the "Halske and Norris." The French makes are "Bougie-Pognon," "Oleo," and "Nilmerior." The English make is "Lodge."

The Bosch spark plug is a three-pole plug, and the Eisemann spark plug a one-pole plug, and it is stated that all spark plugs of European manufacture are uniform in size. In the newer makes the porcelain cap may be exchanged when broken, so that it is not necessary to purchase a new plug when the porcelain becomes defective.

The terms and conditions of sale to distributors or representatives are practically the same, three months' credit usually being allowed. All orders direct to the factories are referred to the distributors or representatives, who receive a certain commission on all sales.

The retail price of a Bosch spark plug is 28 Czechoslovak crowns, about 56 cents at the present rate of exchange, the Eisemann plug being a few cents cheaper.

The duty on spark plugs is 120 crowns per 100 kilograms net weight, with a surcharge of 2500 per cent. The duty on cardboard boxes in which the spark plugs are packed is 720 crowns per 100 kilograms (kilogram equal to 2.2046). A luxury tax of 12 per cent on the invoiced price of the spark plug is also charged.

This Consulate is informed that the American standard screw thread spark plugs are not suitable for gasoline engines used in this district, inasmuch as the thread and size are not the same as those in use here. Moreover, dealers state that, inasmuch as the cost of American spark plugs is more than those manufactured by European concerns, expensive advertising would be necessary before a market could be created.

A Double End, Center-Drive Lathe for Production Work

This lathe is designed for turning shafts and tubes that require work to be done at both ends. By performing all the operations at the same time it accelerates production. It is well adapted to automotive manufacture.

By P. M. Heldt

ONE of the latest types of production machines for automotive plants is a lathe for the turning of shafts and tubes that require work to be done at both ends. It is said to have been developed as a result of industrial conditions during and immediately following the war, when labor was scarce and there was a great demand for rapid production. The machine is known as a double end, center-drive lathe and is the product of Greenlee Bros. & Co.

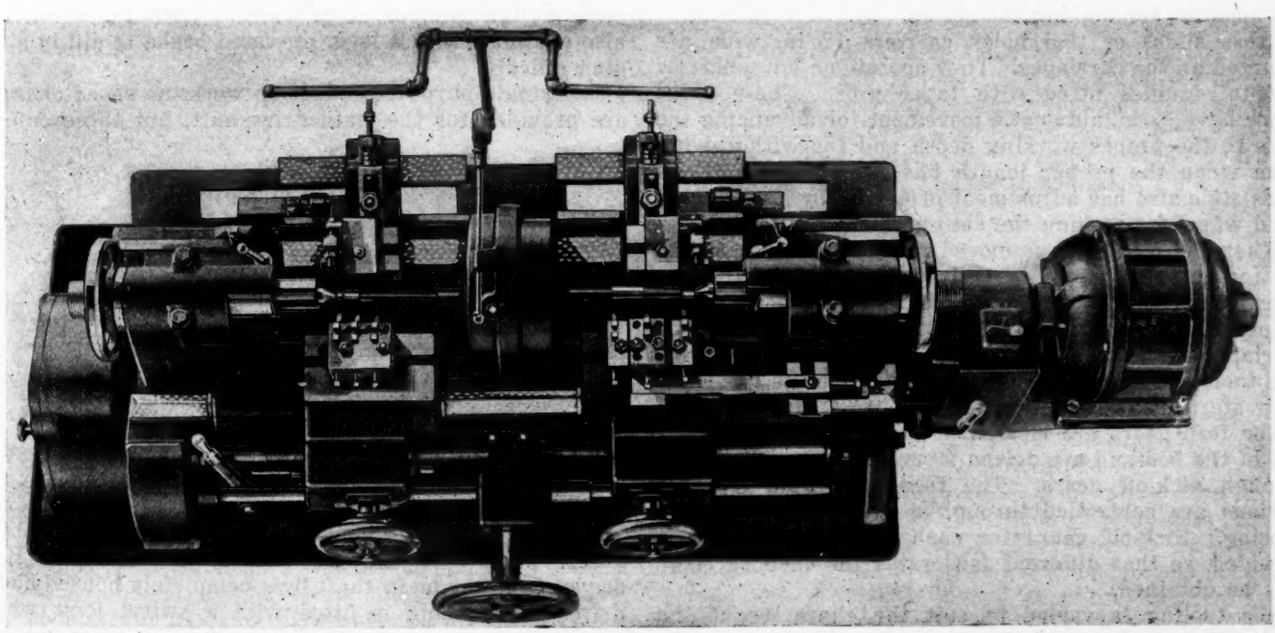
In turning such parts as automobile rear axle shafts in an ordinary lathe, the different operations are performed successively, one at a time, and this is naturally a slow and expensive process. In the Greenlee lathe all of the operations are performed at the same time. The machine is particularly well adapted to a number of operations in the manufacture of automobiles and trucks, such as the machining of rear axle shafts, tubular members of built-up axle housings, propeller shafts, camshafts, armature shafts, etc. The lathe is being built in two sizes, capable of handling maximum lengths of 36 and 60 in. respectively.

The bed of the machine is of heavy box section, closed at both ends and strongly ribbed to withstand the cutting strains. Two pairs of ways are provided, one consisting of a pair of Vees 15 in. from center to center, for the carriages; the other of one flat and one Vee way for the tailstock and the center drive. Underneath the bed is a pressed steel chip pan which drains to the cast iron coolant tank below.

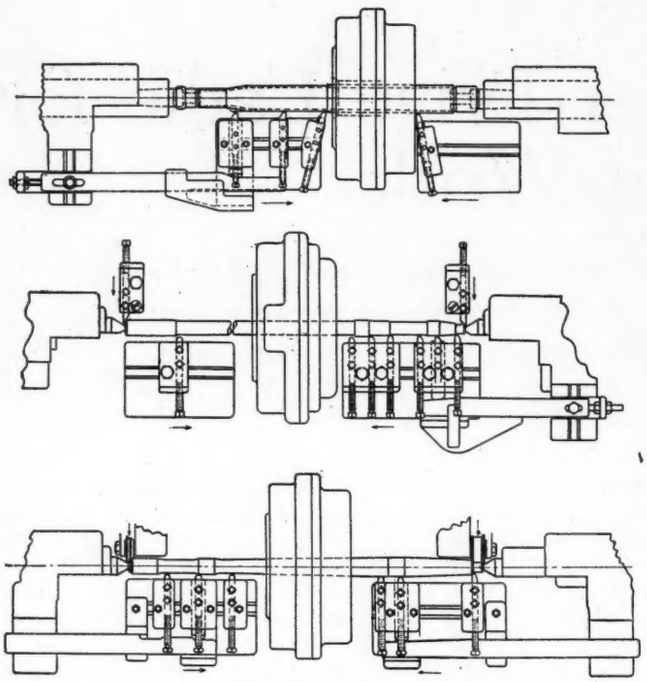
The center-drive head can be adjusted along its ways, and is driven by a keyed shaft running the entire length of the bed. From this drive shaft the power is transmitted to the main gear of the drive head through a pinion and an idler, at a reduction of 3 to 1. The main drive gear is mounted in two ball bearings of large size. The drive is through steel gears with helical cut teeth, and all of the gears are enclosed and run in a bath of oil.

To allow for work being out of center, a universal floating chuck is provided on the center drive head. It is fastened to the main drive gear and consists of two sliding plates which are centered by springs bearing on their peripheries. Shoulder bolts, through clearance holes, hold the plates to the gear. Three self-centering jaws are mounted on studs on the outer plate and are fitted with springs to hold them in contact with the work. A throw-out plate, operated by a convenient handle, is provided to open the jaws when work is to be removed or inserted.

A tailstock is provided for each end of the lathe, and both are adjustable along the ways. The spindles are 3½ in. in diameter, are bored to receive No. 5 Morse



Top view of Greenlee double end, center-drive lathe



(Top)—Layout of tooling for automobile axle tube for production of 60 per hour
(Center)—Layout of tooling for automobile pinion shaft for production of 40 per hour
(Bottom)—Layout of tooling for automobile axle shaft for production of 30 per hour

taper centers, and are run in and out by hand wheels operating on quick-acting threads cut on the ends of the spindles. The nose of each center and spindle is cut away on one side, to provide clearance for the tools when turning small diameters.

Each end of the lathe is provided with a separate carriage operating between the center drive head and its tailstock. These carriages have a bearing on the V-ways 21¼ in. long and are fitted with oil wipers at their ends. Both carriages have 8 in. of travel on the 36-in. machine and 20 in. on the 60 in. machine when the drive head is in the center. A power-operated feed screw is provided for each carriage. The carriage can also be operated by the large hand wheel at the front of the machine for making the set-up.

Cross slides or tool block carriers 12 in. wide are mounted on the carriages. They operate on long, narrow dove-tail guides fitted with taper gibs. These cross slides have ⅝ in. automatic movement for advancing the tools to the proper working depth and for withdrawing them when the proper length has been turned. Each cross slide also has adjustment of 4¼ in. by a graduated hand wheel for making the set-up.

When the feed lever is moved to the starting position, the tools are advanced to their working depth and the carriages then fed toward the center drive head to the proper length to be turned. At this point a dog on the carriage engages a stop which reverses the feed screws. The tools are then retracted and the carriages return to their starting positions.

The feed gears are located in the housing at the left end of the bed and are driven from the main drive shaft through pick-off gears. The feed and rapid traverse motions are controlled through a system of planetary gearing. Pick-off gears for each feed screw are also provided, so that different feed rates for each carriage may be obtained.

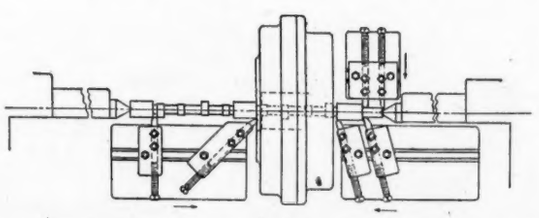
The tooling is varied to suit the character of the work. The steel tool blocks are made with from one to four tools, depending upon requirements, and are mounted on the cross slides by means of T-bolts. Taper turning is done by means of a taper form bar carried on a bracket secured to the tailstock. As the carriage is advanced along the ways, the form bar acts on a sliding tool block carried in a holder mounted on the front cross slide. This fixture can be used for turning odd shapes by having the profile outlined on the bar. It is also used for turning a short straight diameter preceding the taper. When the taper is very steep, requiring a large reduction at the small end, two or more slide blocks are used in one holder.

Rear tools for necking, chamfering, or forming, are carried on slides inclined at 30 deg. to the horizontal. These back tool slides are carried on brackets securely fastened to the center drive head and tailstocks. The connections to the tailstocks are by means of bolts fitted in T-slots, so that the tailstocks, and also the brackets and center drive head, can be moved. The tool block slides are clamped to the brackets when in use and can be located in any position between the tailstock and center drive head when the set-up is made. The tool blocks have only in and out movement. The bracket carrying the tool slide is fitted with a hardened steel block having a cam path cut in its upper surface to produce the cross movement of the tool slide. Each cam block receives its longitudinal movement by being attached to one of the main carriages by an adjustable bracket. A hardened steel roller, connected to the tool block, operates in the cam path and thus produces the in and out movement. One or two rear tool slides are used, depending upon the work to be performed.

When extended cuts are to be made on long shafts of small diameter a roller back rest is furnished. It clamps on the bracket which carries the rear tool slide and can be easily adjusted to the proper location. The top member, which carries the rollers, is hinged to the base so that it can be swung back when stock is being removed from the machine. A quick clamping lever is provided for locking the two members together, and each roller has independent adjustment.

The main driveshaft extends lengthwise through the center of the bed and is driven through reduction gears by means of either a motor or a belt. For belt drive, a clutch between the pulley and the gear driveshaft is furnished. For motor drive, this is omitted as suitable push button control is provided. Both machines are also equipped with a lever operated brake to aid in stopping quickly.

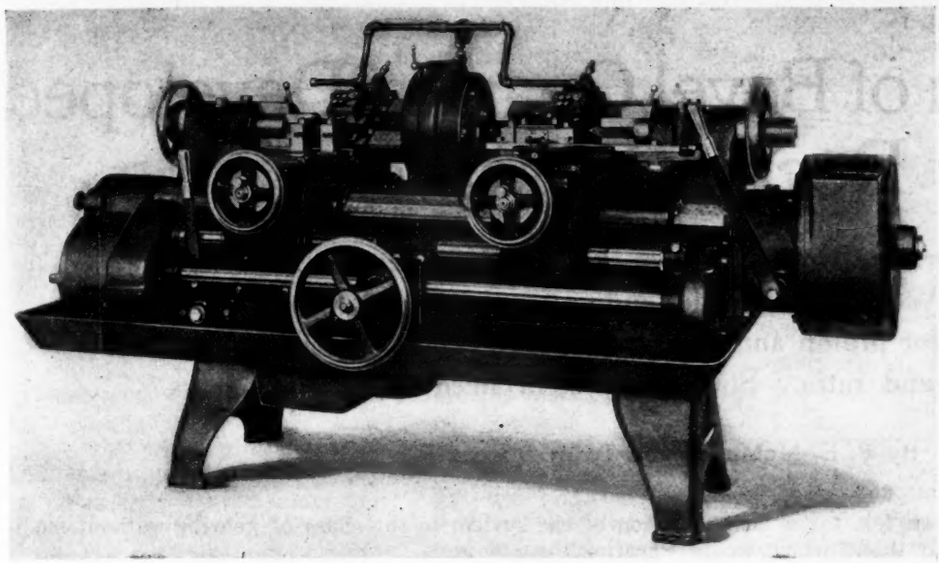
For single purpose production work, no speed changes are provided for the main driveshaft, but these can be



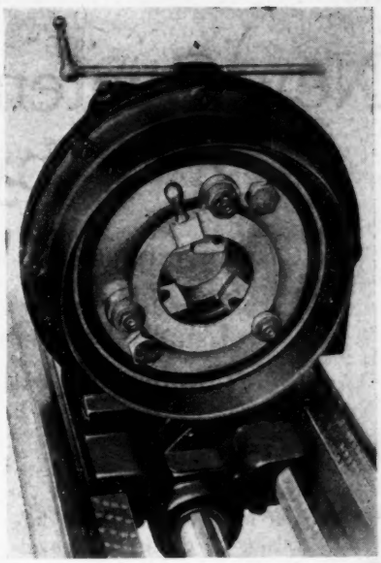
4—Layout of tooling for turning line bearings on cam shaft for production of 30 per hour

furnished for special cases. The drive gears are located in a box at the right end of the bed and are easily accessible for changing the gear ratios.

A liberal supply of coolant is furnished the tools by a geared pump located at the back of the machine. It is driven from the main shaft by a completely housed chain drive. The piping is fitted with a swivel joint which permits it to be swung out of the way while work is being removed or inserted. The coolant flow is regulated by a



Operating side of Greenlee double end center-drive lathe



Universal floating chuck on the center drive head

valve operated from a rod extending through the center drive housing to the front of the machine.

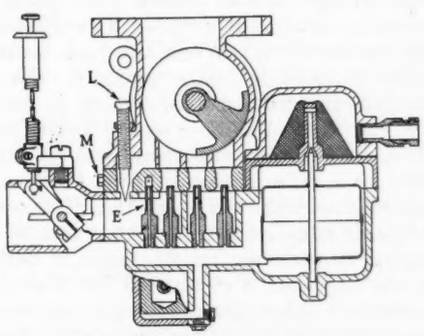
Number of tool layouts for machining automobile parts are shown herewith. On the camshaft the four parallel bearing surfaces are turned and one end of the shaft is chamfered. The production on this job is at the rate of 30 per hour. The camshaft has a total length of about 22½ in. and the bearing diameter is about 1½ in.

In turning the axle tube only the front tool carriages are used. There are three tools on one carriage; while the other has only one, and all take plain cylindrical cuts. The production rate is 60 per hour. A rather more complicated job is that of the pinion shaft, which calls for the use of eight tools, including turning, taper-turning and chamfering tools. As in all operations, the front carriages feed in the direction toward the center drive head, while the rear carriages feed inward. The production on this job is 40 per hour.

Another typical layout for this machine is that for machining a rear axle shaft, evidently for a semi-floating axle. Each of the two front carriages carries three tools, while the back carriages carry special chamfering and necking cutters of the circular type. These shafts pass through the machine at the rate of 30 per hour.

A New Multiple Jet Carbureter

A NEW carbureter, a section of which is shown in the accompanying cut, has recently been placed on the market. It consists of a base casting containing a number of jets of various sizes and a direct acting float with needle valve at the top. A venturi plate in which is formed a number of venturi passages equal to the number



Sectional view of Omac Constant Unit carbureter

of jets is fitted between the base casting and the flanged casting which attaches to the manifold. In the flange casting is a sector shaped throttle arranged to progressively uncover the various venturi openings and thus bring the jets successively into operation. There are from two to four jets and tubes in each range, depending upon the size of the carbureter. The jet E is the idling jet and is controlled by the screw M. Screw L determines the speed of the engine under idling conditions. A choke with dash control is fitted on the main air inlet, while above the float and opposite the fuel inlet is a conical screen of large area. The original setting of the instrument is accomplished by inserting jets of the proper size in the tapped holes opposite the venturi. Thereafter the only adjustment which can be made without changing jets is that provided in the idling screws L and M. The instrument is made by the Jennings Corp. and is known as the Omac Constant Unit.

INVESTIGATIONS into the use of metal in the construction of aircraft have been made in the research department of the British Air Ministry, and they have reported satisfactory progress in the testing of metal propellers, wings, struts, spars and fuselages. Various types of propellers have been tested, including variable pitch propellers adjustable during flight and propellers with metal hubs and detachable blades which can be set at any desired pitch before flight.

In the sphere of navigation steps have been taken to measure the amount of deviation of compasses carried on aircraft containing a large proportion of steel in their construction. A report has been presented to the Aeronautical Research Committee giving the results of laboratory tests on the probable oscillations in flight of various standard and experimental compasses.

New System of Bevel Gearing Developed by Recent Research

Investigation determines quietest form of tooth consistent with strength and durability. Addendum and dedendum for any pitch vary with ratio. Usually different for pinion and gear. Pressure angle depends upon number of teeth and ratio. Standard system needed for spur gears.

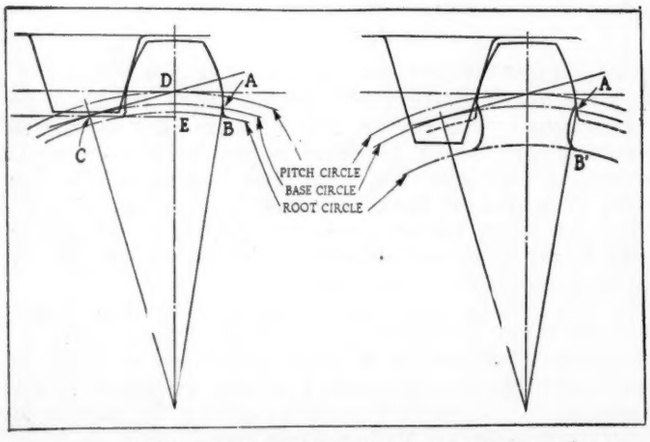
By F. E. McMullen and T. M. Durkan*

FOR a long time a need has been felt for a definite system of designing bevel gear teeth, which would give the most desirable tooth form for use under average conditions. It has been common practice in the past to use spur gear formulas, such as those of Brown & Sharpe, in figuring bevels. These formulas were worked out for an interchangeable spur gear system, which necessarily required some compromise, so that when they are applied to bevel gears, where interchangeability is not a factor, the possibilities of the involute curve are not fully utilized.

The Gleason 0.3 and 0.7 long and short addendum tooth was brought out to improve this condition, and various other alterations of the standard spur gear design have been used, but for the must part these can be applied to certain combinations only and, therefore, are not universal. Recent applications of bevel gearing covering a wide range of ratios have made it imperative that a progressive system embracing all ratios and any number of teeth in common use, be worked out.

An investigation has been conducted by the Gleason Works with the idea of developing a practical system of designing the quietest form of tooth consistent with strength and wear considerations, and the results of this research have been incorporated in a simple table. This system applies to any pair of generated spiral or straight tooth bevel gears operating at right angles where the pinion is the driver and has 10 or more teeth. Bevel gears cut on former type planers are the subject of a special study, as certain practical limitations prevent the application of the system to this class of gearing without modification.

*Paper read before the American Gear Manufacturers Association, Buffalo meeting.



Figs. 1 and 2—Short and long involute teeth in mesh with a rack

Silent Operation Primary Aim

The principal qualities considered in arriving at this system, arranged in the order of their importance, are quietness, strength and durability. In regard to quietness, experience shows that bevel gears cut with a lower pressure angle will operate more quietly than those with a higher one, other conditions being equal. Several reasons account for this: With the lower pressure angle a greater arc of action is obtained, any eccentricity has less effect and the radial component of the tooth load is minimized. Thrust forces also make it desirable to avoid the higher angle, not only because of the introduction of an axial or cone thrust not present in spirs, but also because the majority of bevel gears are overhung from their supports, so that the total load should be kept as low as possible. For these reasons the basis of the system is the use of the lowest pressure angle which will not sacrifice strength by introducing excessive undercut.

It may be well to describe here what is meant by undercut. In Fig. 1 is shown an involute tooth in mesh with a rack. The tooth profile consists of two parts: (1) the involute curve which has its origin at A and continues to the top of the tooth, and (2) the fillet AB lying between the base and root circles. If the rack, which represents the generating tool, does not project below the point C, beyond which involute action cannot take place, the fillet AB will always lie outside of a radial line OA drawn from the origin of the involute. When the rack tooth is made longer so that it extends below point C, the condition shown in an exaggerated form in Fig. 2 is realized. In this diagram the fillet A'B' is seen to come inside of a radial line O'A' and also to cut away part of the involute curve slightly. An examination of Fig. 1 shows that the value for dimension DE, which is the distance from C to the pitch line, is equal to the back cone radius DO x $\sin^2$ pressure angle, so that we might make a definition of undercut by stating that a generated bevel gear tooth is said to be undercut when the dedendum is greater than the back cone radius x $\sin^2$ pressure angle. However, it can be shown mathematically that it is possible to exceed this value considerably before there is any appreciable undercut; in fact for the ordinary automobile rear axle pinion having anywhere from 10 to 13 teeth, the dedendum is nearly always more than this critical value, sometimes being as much as 100 per cent greater. The point at which to limit successful automobile practice, because that application represents a condition where both silence and strength are of equal importance. The 10T-47T 14½-deg.

spiral bevel ratio shown in Fig. 3 has a pinion dedendum 60 per cent greater than the back cone radius x $\sin^2$ pressure angle, and although the undercut is about as great as for any job in the spiral bevel system, it cannot be called excessive. Likewise, the 14T-16T 14½-deg. straight bevels seen in Fig. 4 represent as extreme a case of undercut as will be encountered in the straight tooth system, yet they have a tooth profile which is not weakened to any great extent. The same ratio with a 17½-deg. pressure is shown in Fig. 5, but the strength of the gears is increased less than 5 per cent, although it has the appearance of being more than this.

Low Pressure Angle vs. Strength

The selection of a low pressure angle in preference to a higher one does not result in a considerably weaker tooth, as is ordinarily supposed, because the stronger section of the higher pressure angle tooth is offset by the greater arc of action with the lower angle. Reference to Figs. 3 and 6 will make this clear. Fig. 3 shows a 10T-47T ratio drawn with a 14½-deg. pressure angle and in Fig. 6 the same ratio is laid out with 20 deg. In each case the pinion tooth at the left is just on the point of engaging, so that the tooth at the right is carrying the full load. This will be the worst condition of loading on each tooth, as any further movement to the right brings another tooth into contact, with consequent distribution of the load over two teeth, while movement to the left lowers the line of application of the force toward the base of the tooth. In this position the comparative strength of the teeth can be found by passing a parabola through the intersection, Point A (See Figs. 3 and 6) of the line of action and center line of tooth, and tangent to the tooth profile. The value of $BC^2 \div AD$, which is a measure of the strength, can then be obtained. For the 10T-47T ratios shown in Figs. 3 and 6 the 20-deg. gear is about 14 per cent stronger than the 14½-deg., but the pinions are of equal strength. The 20-deg. ratio, however, is much worse for case hardening on account of the narrow width of top land. A pair of 15T 14½-deg. and another pair of 15T 20-deg. miter gears are shown in Figs. 7 and 8; here the 20-deg. gear is less than 10 per cent stronger than the 14½-deg.

IN ordinary bevel gearing the tooth elements, such as pressure angle, addendum and dedendum, are constant for any given pitch and are determined by the same rules as used for the elements of spur gear teeth. These rules for spur gearing were determined by the desire to make such gears interchangeable, so that any pinion would mesh properly with a gear of any number of teeth from twelve up. This involved certain sacrifices in the way of strength of teeth, efficiency of operation and quietness of action, but these sacrifices were believed to be fully compensated for by the advantage of interchangeability gained.

When the same rules for the proportion of tooth elements were applied to bevel gears the same sacrifices were made, but no corresponding advantages gained, as in right-angled drives a bevel pinion will mesh properly only with the particular size of gear for which it was designed. The Gleason Works in its new system here described, therefore has broken away from the old rules and varies the tooth elements with the number of teeth and the ratio of the drive, so as to favor silence of operation, efficiency and durability in the order named.

Point of Application of Load

This method of calculating the strength is similar to the one used in deriving the Lewis formula, except in regard to the point of application of the load. The Lewis formula is based on the assumption that the load is applied at the end of the tooth, but in modern generating gearing this is a condition which practically never occurs. Prof. Marx in his experiments at Leland Stanford University, found that the force was not at the end of the tooth when failure took place, and also proved that the strength was increased as the arc of action became greater. From a consideration of these conditions it is evident that the choice of a 14½-deg. instead of a 20-deg. pressure angle is not made at any extreme sacrifice of strength, but that for a large number of designs there is very little difference between the two.

Durability

The question of durability viewed from a theoretical standpoint would seem to resolve itself into a problem of obtaining a minimum of sliding and a maximum of rolling motion, as it is natural to assume that the wear would vary directly with the sliding action. But it is well known that the greatest wear often takes place near the pitch point where there is no sliding action. This is because the big factor causing wear is unit pressure and not sliding action. When the point of contact is near the pitch point all the load is borne by one tooth, while it is distributed over two teeth near the beginning or end of action, with a consequent reduction of unit pressure. In Figs. 7 and 8 the part of the pinion profile which will wear most rapidly is FG, because it has to carry the whole load; EF and GH will not wear as fast even though the sliding action is higher, on account of the lower unit pressure. For this reason no attempt has been made in this system to maintain any predetermined percentage of rolling action but rather to balance up between approach and recess the amount of rolling already fixed by the requirements of quietness and strength. Wherever possible, the action during approach has been favored in order to compensate for the change in direction of the friction component which tends to increase the obliquity of the line of action during approach and decrease it during recess. Account has also been taken of the high velocity of sliding action which occurs at the top of long addendum pinion teeth and which, in extreme cases, has led to abrasion. Safe values for this sliding action were obtained from jobs in service and the design regulated so that these were not exceeded.

In establishing the various factors which go to make up the system, the aim was to arrange them in as simple and practicable a form as possible without sacrificing any of the three principal qualities of quietness, strength and durability. In a non-interchangeable system like the one here presented, any of the factors can be made to vary for each ratio and number of teeth, but simplicity and the interests of standardization are opposed to expressing these factors as variable quantities where the probable accuracy of the assumptions made in determining them does not warrant it.

Reasons for Three Pressure Angles

An example of this is the pressure angle. In a purely theoretical system it might have any value, while the same practical results are obtained in this system, which includes all ratios having 10 or more teeth in the pinion, with the use of three angles (14½, 17½ and 20-deg.) for

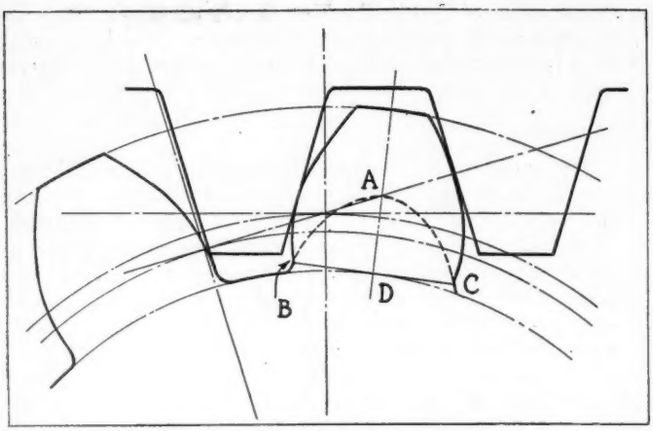


Fig. 3—10T-47T spiral bevel ratio

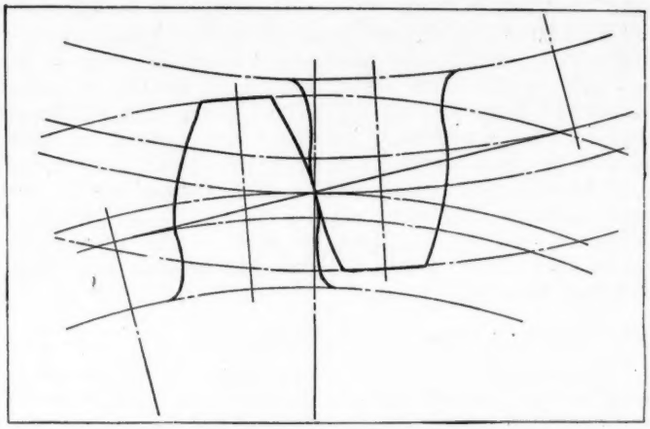


Fig. 4—14T-16T 14½-deg. straight bevel ratio

straight tooth bevels and one angle (14½-deg.) in all except a few unusual cases, for spiral bevels. The pressure angle to be used for any given pair of gears is specified in Tables 1 and 3, and has been selected as the lowest angle which avoids excessive undercut. The introduction of the pressure angle of 17½ deg., which is not universally used, is considered necessary in order to live up to the stated purpose of developing a practical system which will give the quietest form of tooth consistent with strength and wear. It has been found by experience that there is a decided increase in noise when the pressure angle is changed from 14½ deg. to 20 deg., so that in order not to compromise the system when the undercut becomes too great with 14½ deg., an intermediate pressure angle must be called for. The angle of 17½ deg. has been selected because it has already been used to quite an extent by different gear manufacturers. Although at least one pressure angle between 14½ deg. and 20 deg., which are 5½ deg. apart, is required, more are unnecessary because any new angle would not be more than 1½ deg. different from the three selected (14½, 17½ and 20 deg.) and this change is too small to have any practical effect.

Working Depth

The working depth of tooth, which has been fixed as 2.000 in. ÷ D.P. for straight tooth bevels and 1.700 in ÷ D.P. for spirals, is the same as has been successfully used for a number of years. For the average spiral angle of about 30 deg., the normal pitch is approximately 85 per cent of the linear, so the normal section of a spiral tooth will be proportioned about the same as a straight tooth. Originally the working depth for both straight and spiral bevels was made equal to 2.000 in ÷ D.P. but some years ago the depth for spiral bevels was decreased to 85 per cent of this amount because the top of the tooth on the normal was too thin and gave rise to hardening troubles. Stubbing the tooth more than 85 per cent decreased the arc of action and gave a noisier gear. It would be desirable from the standpoint of standardization to use the same working depth for straight tooth bevels as for spirals, but after considerable experimenting along this line, it was found that straight bevels having an 85 per cent stub tooth ran noticeably noisier than similar gears with the full depth tooth. Consequently the standard of 2.000 in. ÷ D.P. has been retained for straight tooth bevels.

The bottom clearance specified in the system is 0.188 in. ÷ D.P. (which is 0.06 x circular pitch) and is the minimum amount which experience shows is necessary for the average job to insure against any bottoming of the teeth. In the past 0.05 x circular pitch has been used and found to have been insufficient while 0.07 x circular pitch, which has also been tried out, is more than is required.

Addendum and Dedendum

The method followed in proportioning the addendum and dedendum was to adjust them until the amount of sliding during approach was about the same or slightly less than the sliding action during recess. This also had the effect of making the arc of recess greater than the arc of approach, which is very desirable, since recess action is quieter than approach. To obtain these conditions it was necessary to decrease the gear addendum and increase the pinion addendum as the ratios of the numbers of teeth in the gear and pinion became greater. These values of addendum for gear and pinion were originally worked out for each ratio and number of teeth, and from an examination of them it was found possible to make an arrangement

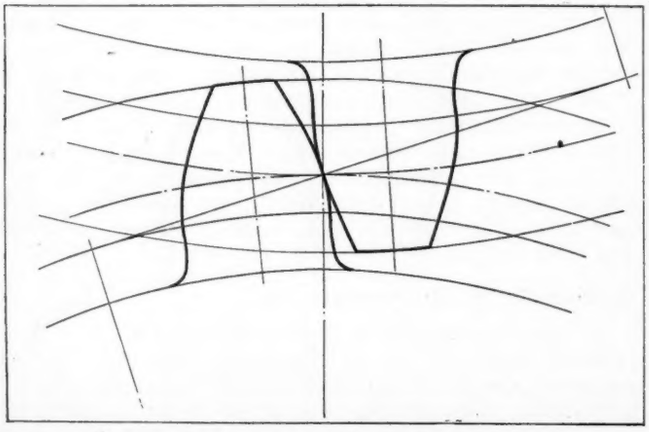


Fig. 5—14T-16T 17½-deg. straight bevel ratio

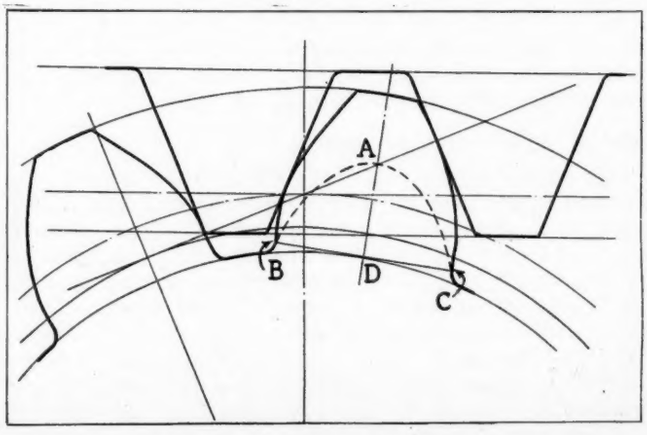


Fig. 6—10T-47T 20-deg. spiral bevel ratio

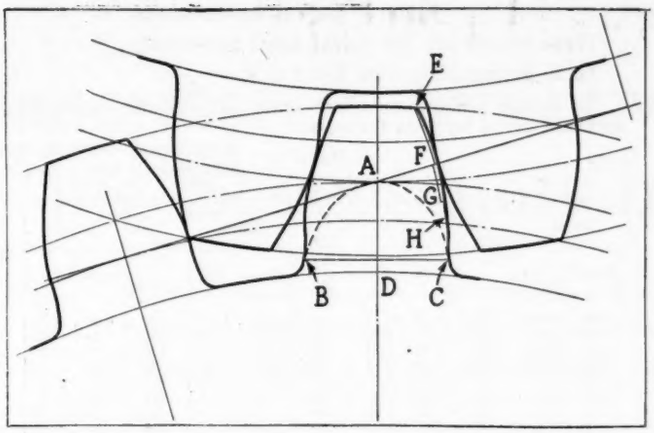


Fig. 7—15T spiral bevel miter, 14½-deg. pressure angle

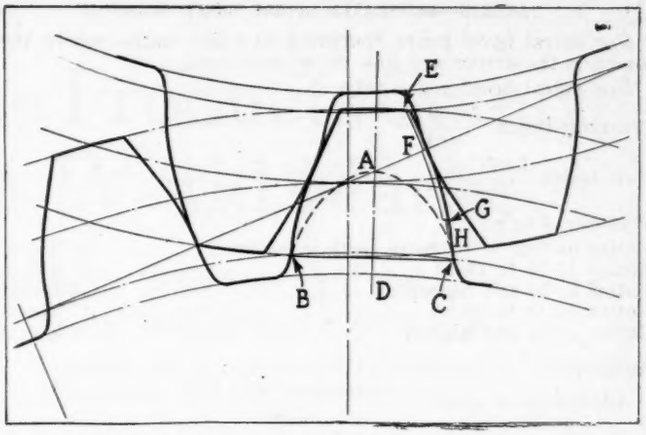


Fig. 8—15T spiral bevel miter, 20-deg. pressure angle

in a simple tabular form according to ratios (see Tables 2 and 4) without any sacrifice of practical qualities.

Circular thicknesses were found entirely by making enlarged layouts in which the teeth were balanced up partly on a width of top land and partly on a strength basis. The formulas given in Tables 1 and 3 were worked out so that they would give the same results as were obtained from the layouts.

Not Untried

In conclusion it can be said that this system is not something new or untried but in the case of spiral bevels at least is represented in practice by a large number of very satisfactory jobs. It also checks up closely with successful straight tooth bevel gear practice although the long and short addendum tooth has not been used as universally for straight tooth bevels as for spirals. The system, as presented, represents in a simple and usable form an intensive study of the question of bevel gear tooth design, treated from both a practical and theoretical standpoint.

It might not be out of place here to express the opinion that a standard non-interchangeable system, possibly along similar lines to the one just presented, is needed for spur gears. In fact, such a system should be of as great importance as a standard interchangeable system since a large proportion of spur gears, like bevels, are intended to operate in pairs only. The concessions made to allow interchangeability are so great that the case of the non-interchangeable gear should be granted as much consideration in the way of a standard system as is given to the interchangeable gear.

TABLE 1—GENERATED STRAIGHT TOOTH BEVEL GEARS

For straight tooth bevel gears operating at right angles where the pinion is the driver and has ten or more teeth.

For straight tooth bevel gears only.

Working Depth $\frac{2.000 \text{ in.}}{\text{D.P.}}$

Full Depth $\frac{2.188 \text{ in}}{\text{D.P.}}$

Pressure Angle

Ratios having 14 or more teeth in pinion .....14½ deg.
Ratios 13-13 to 13-24 .....17½ deg.
Ratios 13-25 and higher .....14½ deg.
Ratios 12-12 and higher .....17½ deg.
Ratios 11-11 to 11-14 .....20 deg.
Ratios 11-15 and higher .....17½ deg.
Ratios 10-10 and higher .....20 deg.

Addendum

$$\text{Addendum of gear} = \frac{\text{Addendum for 1 D.P. (From table)}}{\text{D.P.}}$$

$$\text{Addendum of pinion} = \frac{2.000 \text{ in.}}{\text{D.P.}} - \text{Addendum of gear}$$

Dedendum

$$\text{Dedendum of gear} = \frac{2.188 \text{ in}}{\text{D.P.}} - \text{Addendum of gear}$$

$$\text{Dedendum of pinion} = \frac{2.188 \text{ in}}{\text{D.P.}} - \text{Addendum of pinion}$$

Circular thickness

Circular thickness of gear for all ratios using 14½ deg. $= \frac{1.071 \text{ in.}}{\text{D.P.}} + [.5 \times \text{Addendum of gear}] - \frac{K \text{ (From table)}}{\text{D.P.}}$

Circular thickness of gear for all ratios using 17½ deg. $= \frac{.971 \text{ in.}}{\text{D.P.}} + [.6 \times \text{Addendum of gear}] - \frac{K \text{ (From table)}}{\text{D.P.}}$

Circular thickness of gear for all ratios using 20 deg. $= \frac{.871 \text{ in.}}{\text{D.P.}} + [.7 \times \text{Addendum of gear}] - \frac{K \text{ (From table)}}{\text{D.P.}}$

Circular thickness of pinion for 14½, 17½ or 20 deg. $= \frac{3.142 \text{ in.}}{\text{D.P.}} - \text{Circular thickness of gear}$

TABLE 2—STRAIGHT TOOTH BEVEL GEARS

These vaues are for straight tooth bevel gears only.

Table giving addendum for 1 D.P.

To obtain addendum select from table value corresponding to ratio given by this formula:

$$\text{Ratio} = \frac{\text{Number of teeth in gear}}{\text{Number of teeth in pinion}}$$

Ratios From	Ratios To	Add. In.	Ratios From	Ratios To	Add. In.	Ratios From	Ratios To	Add. In.	Ratios From	Ratios To	Add. In.
1.00	1.00	1.000	1.15	1.17	.880	1.42	1.45	.760	2.06	2.16	.640
1.00	1.02	.990	1.17	1.19	.870	1.45	1.48	.750	2.16	2.27	.630
1.02	1.03	.980	1.19	1.21	.860	1.48	1.52	.740	2.27	2.41	.620
1.03	1.04	.970	1.21	1.23	.850	1.52	1.56	.730	2.41	2.58	.610
1.04	1.05	.960	1.23	1.25	.840	1.56	1.60	.720	2.58	2.78	.600
1.05	1.06	.950	1.25	1.27	.830	1.60	1.65	.710	2.78	2.05	.590
1.06	1.08	.940	1.27	1.29	.820	1.65	1.70	.700	3.05	3.41	.580
1.08	1.09	.930	1.29	1.31	.810	1.70	1.76	.690	3.41	3.94	.570
1.09	1.11	.920	1.31	1.33	.800	1.76	1.82	.680	3.94	4.82	.560
1.11	1.12	.910	1.33	1.36	.790	1.82	1.89	.670	4.82	6.81	.550
1.12	1.14	.900	1.36	1.39	.780	1.89	1.97	.660	6.81	.....	.540
1.14	1.15	.890	1.39	1.42	.770	1.97	2.06	.650	.....	.....	.....

TABLE GIVING VALUES OF "K" FOR CIRCULAR THICKNESS FORMULA

Select value corresponding to number of teeth in pinion and ratio given by above formula.

Number of Teeth in Pinion	Ratios →	Values of "K" for Different Ratios (In.)													
		1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25	2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75	3.75 to 4.00	4.00 to 4.50	4.50 to 5.00	5.00 and higher
10		.025	.070	.100	.120	.140	.160	.175	.190	.205	.215	.225	.230	.240	.250	.255
11		.010	.015	.050	.080	.105	.125	.145	.160	.170	.180	.190	.195	.200	.210	.220
12		.000	.040	.070	.100	.120	.140	.155	.170	.180	.185	.190	.195	.205	.210	.215
13		.000	.015	.040	.045	.050	.060	.070	.080	.090	.100	.110	.120	.135	.150	.165
14		.000	.015	.030	.050	.065	.080	.090	.100	.110	.120	.125	.130	.140	.150	.160
15 to 17		.000	.000	.010	.020	.030	.045	.060	.070	.080	.090	.095	.100	.110	.115	.120
18 to 21		.000	.000	.000	.000	.010	.030	.045	.060	.070	.080	.085	.090	.095	.100	.100
22 to 29		.000	.000	.000	.000	.010	.030	.040	.050	.060	.065	.070	.070	.080	.085	.085
30 and up		.000	.000	.000	.000	.010	.025	.035	.040	.045	.050	.055	.060	.065	.070	.070

TABLE 3—GENERATED SPIRAL BEVEL GEARS

For spiral bevel gears operating at right angles where the pinion is the driver and has 10 or more teeth.

For spiral bevel gears only.

Working Depth $\frac{1.700 \text{ in.}}{\text{D.P.}}$

Full Depth $\frac{1.888 \text{ in.}}{\text{D.P.}}$

Pressure Angle

Ratios having 12 or more teeth in pinion .....14½ deg.
Ratios 11-11 to 11-19 .....17½ deg.
Ratios 11-20 and higher .....14½ deg.
Ratios 10-10 to 10-24 .....17½ deg.
Ratios 10-25 and higher .....14½ deg.

Addendum

$$\text{Addendum of gear} = \frac{\text{Addendum for 1 D.P. (From table)}}{\text{D.P.}}$$

$$\text{Addendum of pinion} = \frac{1.700 \text{ in.}}{\text{D.P.}} - \text{Addendum of gear}$$

Dedendum

$$\text{Dedendum of gear} = \frac{1.888 \text{ in}}{\text{D.P.}} - \text{Addendum of gear}$$

$$\text{Dedendum of pinion} = \frac{1.888 \text{ in.}}{\text{D.P.}} - \text{Addendum of pinion}$$

Circular Thickness

Circular thickness of gear for all ratios using 14½ deg. $= \frac{1.061 \text{ in.}}{\text{D.P.}} + [.6 \times \text{Addendum of gear}] - \frac{K}{\text{D.P.}}$ (From table)

Circular thickness of gear for all ratios using 17½ deg. $= \frac{0.976 \text{ in.}}{\text{D.P.}} + [.7 \times \text{Addendum of gear}] - \frac{K}{\text{D.P.}}$ (From table)

Circular thickness of pinion for 14½ deg. or 17½ deg. $= \frac{3.142 \text{ in.}}{\text{D.P.}}$ — Circular thickness of gear

TABLE 4—SPIRAL BEVEL GEARS

These values are for spiral bevel gears only.

Table giving addendum for 1 D.P.

To obtain addendum select from table value corresponding to ratio given by this formula:

$$\text{Ratio} = \frac{\text{Number of teeth in gear}}{\text{Number of teeth in pinion}}$$

Ratios From	Ratios To	Add. In.	Ratios From	Ratios To	Add. In.	Ratios From	Ratios To	Add. In.	Ratios From	Ratios To	Add. In.
1.00	1.00	.850	1.15	1.17	.750	1.41	1.44	.650	1.99	2.10	.550
1.00	1.02	.840	1.17	1.19	.740	1.44	1.48	.640	2.10	2.23	.540
1.02	1.03	.830	1.19	1.21	.730	1.48	1.52	.630	2.23	2.38	.530
1.03	1.05	.820	1.21	1.23	.720	1.52	1.57	.620	2.38	2.58	.520
1.05	1.06	.810	1.23	1.26	.710	1.57	1.63	.610	2.58	2.82	.510
1.06	1.08	.800	1.26	1.28	.700	1.63	1.68	.600	2.82	3.17	.500
1.08	1.09	.790	1.28	1.31	.690	1.68	1.75	.590	3.17	3.67	.490
1.09	1.11	.780	1.31	1.34	.680	1.75	1.82	.580	3.67	4.56	.480
1.11	1.13	.770	1.34	1.37	.670	1.82	1.90	.570	4.56	7.00	.470
1.13	1.15	.760	1.37	1.41	.660	1.90	1.99	.560	7.00	.....	.460

TABLES GIVING VALUES OF "K" FOR CIRCULAR THICKNESS FORMULA

Select value corresponding to number of teeth in pinion ratio given by above formula.

Number of Teeth in Pinion	Ratios →	Values of "K" for Different Ratios (In.)														
		1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25	2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75	3.75 to 4.00	4.00 to 4.50	4.50 to 5.00	5.00 and higher
10		.020	.055	.085	.105	.125	.125	.110	.120	.130	.140	.150	.155	.160	.170	.180
11		.030	.075	.105	.070	.085	.095	.105	.115	.125	.135	.140	.145	.150	.155	.160
12 to 13		.005	.015	.025	.035	.045	.055	.065	.075	.085	.095	.105	.115	.125	.135	.135
14 to 16		.000	.005	.015	.025	.035	.050	.060	.075	.085	.095	.100	.105	.105	.105	.105
17 to 19		.000	.000	.005	.015	.025	.035	.050	.065	.075	.085	.090	.090	.090	.090	.090
20 and up		.000	.000	.000	.005	.015	.025	.040	.050	.055	.060	.060	.060	.060	.060	.060

Commercial Aviation Developing Through Successful Operation

ONE important development in American civilian aviation is the successful operation of the Aeromarine Airways, Inc., of New York, Key West and Havana. Convinced that commercial aviation could be made a safe and financially successful business enterprise if conducted by an efficient organization possessing proper equipment, officials of Aeromarine Airways started their Key West-Havana service in the winter of 1920-21. At the close of their second Southern season on April 1 last, Charles F. Redden, president, set to work checking up figures, operating costs and statistics. The books of the company showed that it had made money; but he wanted to know how closely the practical results coincided with the theories on which they have based their operations.

He found that Aeromarine Airways from Nov. 12, 1920, to April 1, 1922, had flown an aggregate distance of more than 150,000 miles and carried a total of 10,700 passengers—without an accident.

Since last November (1921) Aeromarine Airways made:

184 flights between Key West and Havana.
55 flights between Key West and Miami, Fla.
91 flights between Miami and Bimini.
53 flights between Miami and Nassau.
16 flights between Miami and Palm Beach.
345 special charter and miscellaneous sightseeing flights.

In that period, the season just closed, 268,535 passenger miles were flown, in a total of 713 hours in the air. Out of the total of 749 flights, all but five were completed; the five being discontinued because of weather conditions, and the planes returned to the starting point. Not a single passenger or employee was injured in these operations. The schedule was maintained throughout with the exception of the five postponed flights. Three types of flying boats were used: the 11-passenger flying cruisers of the F.5-L type; the Navy Coast Patrol 6-place Hs2L type, and Aeromarine 3-place flying boats.

"Efficiency of the operating personnel, pilots and mechanics and officials at each base, continuous inspection and maintenance of aircraft, adherence to the rule of 'Safety First,' observance of weather conditions and knowledge of routes combined to bring about this progressive situation," says Mr. Redden in his report. "We know now that aircraft can be operated at a profit, without endangering lives."

Ceylon Builds Rubber Pavement

THE Ceylon Public Works Department is experimenting with rubber for road paving. A Chilaw bridge paved with rubber blocks has stood wear and tear fairly satisfactorily. The P. W. D. intends to experiment on a stretch of road in the Fort of Colombo, where traffic is specially heavy. Ceylon, of course, is a rubber-producing country and in times of over-production there may be the same justification for using rubber as a paving material there as there is in using corn as fuel in Nebraska. But rubber at 50 cents a pound does not stand much chance of competing with cement at 50 cents a bag in road paving generally.

American Automotive Products Competing Successfully in World Markets

Some markets are expanding rapidly while others are still far from normal. American cars leading in New Zealand but England making rapid strides. Supply of parts necessary in Denmark to compete with Germans.

A GENERAL survey of many of the foreign markets may be gleaned from the following reports which are for the most part obtained from Consular Reports. In several instances statistics are given which show the extent of competition between the leading manufacturing and exporting nations of the world.

It will be seen that our chief competitors are England, France, Germany and Italy, and the strength of competition varying in different countries. We may say in general that the favorable factors for the American exporter are the products themselves and their low price while the unfavorable factors are the rate of exchange with the various countries and the high tariffs.

Reports to the Department of Commerce show that the American and British exporters are running a neck-and-neck race for automotive business in South Africa. Prices of American cars are lower, but an active campaign of propaganda carried on by British manufacturers is helping their sales. The British makers enjoy several advantages in South Africa, including a 3 per cent preferential tariff; a sentimental preference declared to be equal to at least 10 per cent; an advantage in exchange amounting to 10 per cent or 12 per cent and the advantage of lower freight rates.

Lower prices of American cars as compared with those of European-made motor vehicles have offset almost entirely the effects of adverse exchange and high duties in Trinidad, British West Indies. There now are registered 1961 motor vehicles in the colony, or about double the number three years ago. This includes about 200 motor trucks. Imports in 1921 were only about 100, but in 1920 they were 624, all but 18 of which were from the United States. The present demand is relatively much larger for motor trucks than for passenger cars. The trucks are used chiefly for the transportation of cocoa and in the petroleum district. There also has arisen a demand for buses.

British imports of motor vehicles in March were: Cars and cabs, 887 as compared with 696 in March, 1921; trucks 59, as compared with 172; passenger car chassis 636, as compared with 285; motorcycles 119, as compared with 25. The big increase in imported car chassis is explained by the reductions in prices of certain American cars. Exports of British motor vehicles in March were: Cars and cabs 126, as compared with 227 in March, 1921; trucks 41, as compared with 65; chassis 67, as compared with 115; motorcycles 709, as compared with 817. These figures reflect the effect of the labor trouble to a small degree.

Ground lost in New Zealand by British motor manufacturers during the war is now being made up, according to a report in the London *Times*.

From figures furnished by the Customs, the New Zealand Motor Trade Association, Inc., has made deductions which are as follows:

Origin of Imports	1919	1920	1921
Cars	Per cent	Per cent	Per cent
Canada	54	44	32
United States	44	46	42
Great Britain	2	10	20
Continent	..	..	6
Trucks and Lorries			
Canada	70	58	35
United States	27	26	30
Great Britain	3	16	29
Continent	..	..	6
Total values, including chassis.	£1,125,088	£2,921,173	£1,210,762

Origin of Imports of Tires, Tubes, etc.	1921 Value	1921 Per cent
United States	£247,383	34½
Australia	160,459	22½
France	134,120	19
Great Britain	66,174	9
Canada	65,062	9
Italy	40,554	5
Belgium	531	1
	£714,283	100

The values are fair market values in countries of export at time of shipment, *plus* 10 per cent.

New Zealand can offer but a limited market for the higher priced English cars, but the desire to possess them persists. The cheaper American or Canadian cars meet the needs of people of moderate means.

There are 79,500 passenger cars, 5400 trucks and 35,000 motorcycles registered in Australia. The majority of the passenger cars, 32,000, are in New South Wales and Victoria, which has 22,000 passenger vehicles.

Exports of Italian motor vehicles are increasing as a result of recovery in the home industry. Italian cars are selling particularly well in Rumania, Bulgaria and Jugoslavia. The co-operative land movement is growing steadily, and more than 500,000 acres were cultivated co-operatively last year. This suggests a growing market for tractors and trucks.

A recent census of automobile trucks in Naples, Italy, showed about 2500, the major portion of which were old stock Italian army motor equipment disposed of by the government to private firms and individuals. The most popular truck in use is the 2½-ton Fiat equipped with pneumatic tires and double rear wheels of the disk type. There is said to be little opportunity for the sale of American trucks because of the fact that all American automotive equipment must pay a high import duty.

Approximately 3000 passenger automobiles, 400 trucks and 500 motorcycles are used in Bilboa, Spain, of which 30 per cent are of American make.

The sale of automobiles in Spain on a consignment basis by German, French and Belgian manufacturers has been threatening the American automobile market in that country, and the depreciation of the monetary systems in these three countries is a decided factor in their favor. However, recent reports indicate that automotive business conditions are improving. Representatives of American firms report increased sales. A much larger volume of business it is expected will result from the recent tariff which went into effect on April 17 with an average of somewhat lower rates.

In Hungary there are very few American passenger cars, trucks or motorcycles, due to the high import duty and the low purchasing value of the Hungarian crown. German and Italian cars are well known and favored. It is estimated that there are 3000 passenger cars in Hungary, about one-half of which are in running order. The motor trucks number about 200 and motorcycles about 600. A good car can be bought in Hungary now for about 2,500,000 Austrian crowns, although a few of the smaller cars can be sold at a less amount.

American exporters are advised that if they expect to do any business in Denmark it will be necessary to carry a full stock of parts and accessories due to German competition. At the present time German competition is strong in this market and is undoubtedly the cause of the constant fluctuations in automotive prices. American cars are under the additional handicap of high taxation on any car over 10 taxable horsepower, which amounts to about 30 horsepower, American rating.

The vital need of machine power in Turkey has become obvious and urgent, as a result of the exhaustion of the available supply of animals in the long-drawnout wars, most of the draft animals having been used for cavalry and artillery purposes and many of them to supply food for the soldiers. Consequently a demand is arising for the tractor and the plow, says Consul General Ravndal in a report to the Department of Commerce. American tractors, as well as other American-made farm machinery, possess a fine reputation in Turkey, and at present dominate the market. The Hahnemann (German), Fiat (Italian) and Renault (French) tractors are in the field, but they cannot compete successfully with the American machines which are being offered. The chief desiderata are price, efficiency and simplicity and the American tractors have been found to fill these requirements.

Of the 400 automobiles in Salvador only 330 are in actual use, according to a report to the Department of Commerce by Vice Consul Franklin, San Salvador. Eight are of European make, the rest American. As millimeter clincher tires are not imported from Europe, car owners have been forced to change the rims to receive American size tires. Due to the very rough and mountainous roads, oversize tire equipment is quite common. Seventy-five per cent of the tires sold are of cord construction. American tires are regarded as superior to the European makes, they arrive in much less time and are in fresher and better condition upon arrival than those from Europe. American and European prices delivered are practically on a par, though there is a tendency for European prices to drop from time to time. Distribution is effected through exclusive agents who sell at retail. No mileage guarantees are given as a rule. Terms vary, though they are generally 60 days' draft after arrival of goods. Some European manufacturers are offering 60 to 90 days, and when the individual case will warrant it, it would be well for American firms to meet this practice. The average car owner uses from 4 to 5 tires per year. Red inner tubes are preferred.

There are about 15 trucks in use, nearly all of which employ solid tires. American motorcycles and tires dominate the market entirely.

Latest statistics show that there are 740 tractors in Tunis, ranging from 10 to 70 hp. Of these, 580 are American, 95 French and 20 British. Ten to 20-hp. tractors are most popular in French North Africa.

A census of motor vehicles in Cuba indicates that there are about 20,000 on the island at this time. About half the number are in Havana, which is known as a city of taxicabs. The registration of motor trucks shows 2923 with 30 trailers.

American motor vehicles, especially the heavy types, are popular in Poland chiefly because of the surplus war stock sent into that country. Sales at this time are hampered by the low value of the Polish mark and the high price of gasoline. The Poles have consequently turned their attention to the lighter cars with a lower gasoline consumption. With the exception of motor equipment for agricultural purposes the motor vehicles in Poland are largely concentrated in the cities.

There are some 250 privately owned motor cars and trucks in Smyrna, practically all of American manufacture, says Consul General Horton, in a recent report to the Commerce Department. Ten per cent of the cars are equipped with metric clincher tires, 50 per cent with inch clincher tires, and 40 per cent with straight sides. Ninety per cent of the cars are equipped with fabric tires because of their lower price. American tires are more popular than foreign makes and compare favorably in price, which is the controlling factor rather than quality. The roads are bad and very severe on tires.

The possibility of automobile imports in Nanking Consular District of China is reported to be remote, according to reports received by the Bureau of Foreign and Domestic Commerce. In the district comprising 90,000 square miles having 60,000,000 population, the census figures show there are only 300 miles of automobile roads. Roadbuilding enterprises are reported to be in progress and plans for a large amount of road construction are now being undertaken by the states.

Due to this lack of roads the district offers only a limited market at the present time for American motor vehicles, but one which in the coming decade will in all probabilities attain considerable dimensions.

As the present-time market demands are limited and as the three localities in which motor vehicles are in actual use are widely separated, there are no firms in this district conducting direct import of motor vehicles or accessories. The demands of this market are supplied from Shanghai. For the present any connection made in that city by American manufacturers may be considered as covering the subsidiary markets of the Nanking District. Exact figures as to the number of automobiles in the district was not available, but it is estimated that over 90 per cent of the motor vehicles now in use in this district are of American manufacture.

Study the Individual Worker to Solve the Human Problems of Industry

This is one essential principle brought out in Harry Tipper's new book, "Human Factors in Industry." The volume is fundamental in character and forceful as to treatment. The present upward swing of industrial activity makes this discussion of industral relationships especially timely.

By Norman G. Shidle

HARRY TIPPER is business manager of AUTOMOTIVE INDUSTRIES. Consequently, we felt it best to make an agreement with him before we read this new book of his that we could say all the unkind things about it that, as an editor, we take pleasure in saying about the writings of others. This critical pleasure is not due to any inherent maliciousness in our nature, but probably to that very human characteristic of desiring to do unto others as they do unto you. Anyhow, we had our critical pencil all sharpened to a fine point.

Having read Tipper's sentiments on the problems of human relation in industry as expressed in our columns for the last two or three years, we had some idea of what to expect. We expected something very good. But we still had hopes of getting a chance to play the critic. We have been disappointed.

We are forced to state that "Human Factors in Industry" is a brief, forceful and interesting analysis of the factors underlying the human elements in industrial organization, and that it contains the clearest and most fundamental thinking that has been made public on this subject.

Before reading this volume many executives will not agree with all of Tipper's conclusions. The logic and clarity of the reasoning leading to those conclusions, however, as brought out in the book is certain to make converts—and is certain to be of practical value to automotive executives in handling the problems of industrial organization which are again becoming pressing.

Automotive production has swung rapidly upward during the last four months. Unemployment has materially decreased and a shortage of workers of certain kinds is already reported in important manufacturing centers. All the problems of labor and industrial relationships bid fair to become more or less acute again, after a year and a half of comparative quiescence.

Thus, the publication of "Human Factors in Industry" by Harry Tipper is opportune. The volume is being published by the Ronald Press Company of New York City.

To discuss adequately a book of this fundamental character in a brief review is difficult. The best the reviewer can do is to give some idea of the topics covered and the conclusions drawn, leaving to those interested the pleasant task of reading the full text for themselves.

CONCERNING human relations in industry Harry Tipper says:

"It is not possible to provide more knowledge to the individual, increase his ambition and quicken his desires, and at the same time demand that he limit himself to work that is becoming more automatic in its character and less intelligent in its necessities."

"The expressed obligations representing the moral advancement of the social organization have become so separated from the industrial obligations that there is no co-operation between the two and the social rewards are not in any way related to the business morality."

"In principle there is no difference between the actions of the manufacturers' organizations upon labor matters and the actions of a trade union. The group of employers are concerned with maintaining as much control of labor as possible, while the group of workers are concerned with establishing their own objects as far as possible."

Three ideas stand out prominently in this book:

1. The study of industrial relations must be approached from the standpoint of the individual—his development, his reaction to his work, the effect of education upon that reaction, the effect of mental and physical fatigue, his attitude toward management, etc.

2. There is greater need for decentralization in industry than for further centralization. As centralized control increases, the necessity for supervision increases, until at a certain point efficiency begins to decrease. Efficiency can best be developed, in the long run, through the development of the individual capacities of the various workers.

3. A better leadership is necessary. The employer in olden times was the master craftsman and held his position of leadership by reason of his constantly visible superiority as a workman. Modern industry does not tend to develop leaders. Workers are bound to have leaders, whether from their own ranks, from the labor unions or from employers. Leadership must be given and developed.

Building up his discussion of these points, Tipper treats the principles behind labor union growth in Great Britain and in America and points out the differences. He shows the effect of increased specialization upon our social organization and says that "the progress of the social organization must be made as a whole, if we are to continue its development without disaster. This separation of the home, the occupation, and the school, until they possess little or no visible connection with one another, has altered the whole aspect of industry. . . . The effect of this is seen in the constant struggle of different groups of the

population to advance their position as a group, without respect to the difficulties such advancement may impose upon the whole structure, and therefore the limitations that may be put upon their own development. . . . At present there is no direct training in the necessary morals of industry, and the only moral training which exists has no visible connection with the industrial life."

Manufacturers' organizations are discussed very frankly and collective bargaining as related to the balance of power in industry is treated in detail. The failures of present group organization are pointed out and many of the typical experiments in industrial representation are critically examined.

"Incentive" and "Fatigue"

Two specially good chapters are those on "Incentives" and "Fatigue." In the former, the five factors of incentive are listed as follows:

1. The visible object of the work.
2. The importance of the visible object.
3. The opportunity for individual expression or skill.
4. The character of the surroundings.
5. The reward.

The relation of these factors to actual practice is discussed and methods of applying principles to production practice are laid out.

The chapter on "Industrial Relations' Departments" points out the possibilities and limitations of such departments and emphasizes the dangers of attempts to standardize methods and technique at the present time. It shows the necessity for a careful study of human problems by every executive who has any workers under his supervision.

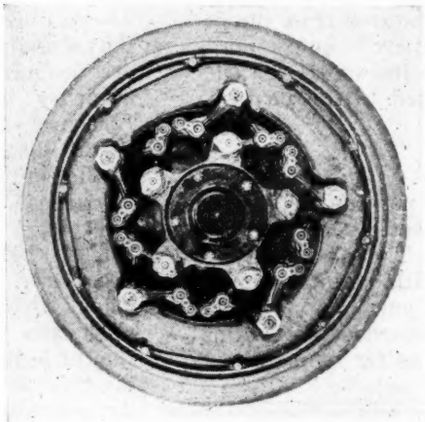
Bonus schemes are discussed, as well as the open shop and the failure of both employers and labor unions to approach the human problem from a sound, constructive angle.

To those who have followed Harry Tipper's articles in AUTOMOTIVE INDUSTRIES, this volume will be a welcome summary, in logical and clear form, of the various ideas and ideals that have been expressed from time to time. The book is a complete, fundamental study of the human problem, however, and is in no sense a series of articles.

To those who are unfamiliar with the articles, the book will give a wealth of new ideas on this most important industrial problem.

Weston Pneumatic Cushion Wheel

A TRUCK wheel with a pneumatic cushion between the rim and the hub is being manufactured by the Weston Wheel Mfg. Co. The hub of the wheel is made in the form of a five armed spider. Its arms are forked at the outer ends to take linkages which bear on the inner surface of the double tube pneumatic cushion by means of driving pins and supporting rollers. The driving pins bear on what are called post plates which are in the form of cylindrical half shells riveted to the inside of the cushion cover, and the rollers bear on wear plates which are concentric with the wheel and are also riveted to the inside of the cover. All bearings of the linkage are provided with self-lubricating bushings. The inner tube and cover of the pneumatic cushion are made with five recesses on their inner side into which the post plates are fitted. It will readily be understood that the radial loads are taken up chiefly on the wear plates, while the tangential loads, both driving and braking, are taken up mainly on the post plates. The posts are made of nickel steel. Provision is also made for taking up lateral shocks on the wheels. The nickel steel posts surrounded by the post plates are forced into bosses on an inward flange of the rim which takes the felloe band. On the rear wheel there is a dust cover fastened to the rim which covers the whole wheel, including the hub. On the front wheel there is a similar cover, but the outer end of the front hub projects through this cover. From the cushion the drive is transmitted to the rim by friction, which is materially increased by casting the inner surface of the rim with five flats.



Weston pneumatic wheel

The object aimed at in the design of this wheel is, of course, to relieve the shocks to which a heavy truck wheel is subjected and which are very destructive. This includes both the road shocks and the driving and braking shocks. A maximum cushioning range of 1¾ in. is obtained which is very much greater than the slight cushioning range of the solid rubber tires. It is claimed that the life of the solid rubber tires is very greatly increased as a result of the reduction in shocks due to the cushion. A Weston rear wheel designed for a Packard 3½-ton truck weighs 860 lb.

Commutator Dressing Stone

A TOOL which is designed to make it unnecessary to remove an armature from the generator when it has become necessary to true up and smooth the commutator has been put out by the Martindale Electric Co. It consists of a handle with a block of artificial abrasive stone at each end, one block being coarse and the other fine. Each stone is said to grind at least ten commutators.

Imperial dressing stone for use on commutators

The abrasive is an insulating material; it is said not to be injurious to the mica and to be usable on commutators of machines of all voltages. The stones are made L-shaped, to permit their use at any angle. Ordinarily when a commutator becomes slightly rough it is trued up or smoothened with a piece of sand paper, but this will not cut down projecting strips of mica. The tool is known as the Imperial automobile commutator stone.

The Argentine Is Buying American Automotive Products

Excellent wheat and corn crops, together with large increases in wool and hide exports, have brought Argentina back into the buying market. Crisis in livestock industry passing. Nearly five hundred American cars were sold to this market in March. Financial condition fundamentally sound.

By M. T. Meadows

TO-DAY the products of the American automotive industry, especially of that section dedicated to the production of popular-priced passenger cars, find their way into every city, town and rural district of Argentina—merchants, manufacturers, professional men and the moneyed classes in the cities are no more desirous of owning a car than the prosperous farmers of the grain growing regions or the substantial cattle men on the grassy plains.

Prospects for cars are still to be found among the owners of vineyards and fruit orchards of Mendoza, the cane growers of Tucuman and Jujuy and the cotton planters of the Chaco. Lonely goat herders in the hills of Salta, like their colleagues who pasture millions of sheep on the wind-swept ranges of Chubut and Santa Cruz, look forward to the day when the bleakness of their surroundings will be lessened through good roads and automobiles. Mine owners in San Luis, San Juan and Catamarca too have their transportation problems which only motor cars and trucks can solve, while the lumbermen of Santiago del Estero and Misiones see in motor transportation a valuable ally. Yerba Mate interests, rice growers and tobacco planters in fertile sections of the country are also producers of wealth, a portion of which is spent on automotive products. Truck and dairy men, as well as those engaged in the poultry business, are not to be overlooked. In fact, there are but few lines of American manufactures which encounter more universal demand in Argentina than those turned out by makers of motor vehicles and their accessories.

Sales Depend on Exports

Given the universal demand for cars already created, the rate at which the Argentina market absorbs them logically depends, within the bounds of the present-day population, upon the purchasing power of the country. This purchasing power in turn is determined exclusively by the export demand for Argentina's foodstuffs and raw materials, as well as upon the prices these bring in the consuming markets of Europe and the United States. Consequently a clear conception of the present status and the future prospects of the local automotive market can only be gained when a full understanding is had of what is occurring in Argentine exports.

Since 1914 Argentina's capacity for production has expanded on a scale proportionate to that of the United States. Consequently the country was never in a better position to produce real economic wealth than to-day. Moreover, her production is limited to foodstuffs and raw materials, which constitute prime necessities. These may be, for determined reasons, a temporary drug on consuming markets, but such cannot be the case over a long period of time. It is reasonable to assume, therefore, that Argentina, holding as she does the largest exportable surpluses in her history, will continue the progress toward the recovery which set in during the closing months of 1921.

The list of Argentina's minor export items is a long one. Each of these naturally affect the purchasing power of those engaged in their production. But fully 80 per cent of Argentina's exports are limited to a few bulk commodities: Livestock industry—beef, mutton, pork, wool and hides; farm produce—wheat, corn and linseed. Prosperity or hard times are accurately shown when the movements of these are traced on Argentina's graph. With these commodities as a guide, let us examine the present state of general business conditions in Argentina:

Wheat Crop Portends Buying

The 1921-22 wheat crop has been good both in yield and quality. From January 1 to April 7 1,352,257 tons have been sold at remunerative prices against 579,820 tons for the same period of 1921. The exportable surplus now on hand is 2,880,896 tons. The prospects of disposing of the entire crop are promising and the market tendency is toward further strength. An increase of 10 per cent in prices has taken place since January 1. With the exception of the southern part of the province of Buenos Aires and certain districts of the Pampa Central, the wheat farmers are in good shape. They have purchased a large percentage of the cars sold since January 1, and it is upon them that the local dealers must depend for the bulk of sales during months to come.

Weather conditions throughout the growing season of the present corn crop have been exceptionally favorable. Corn exports in 1922, however, 464,364 tons, are barely in excess of those for the same period in 1921; namely, 420,530 tons. They are hardly one-half of what they were in 1920.

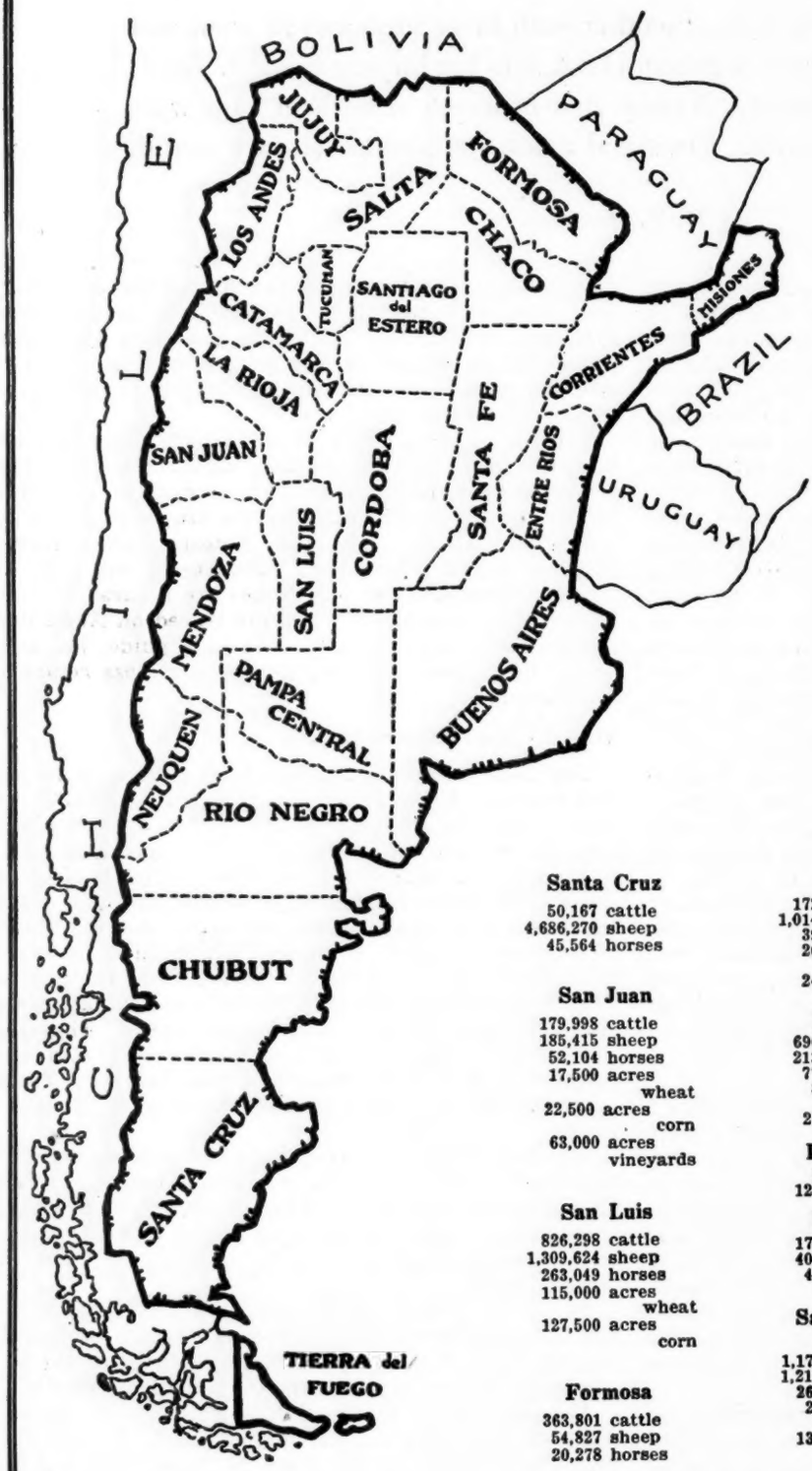
Prices are remunerative, and were it possible to market the 3,878,000 tons on hand—which is to be expected—farmers in the corn belt around Rosario should be in a position to purchase motors and supplies liberally.

Linseed exports this year have fallen below those of 1921—212,609 tons against 354,684 tons. It is believed that the demand for the stock on hand, 1,248,412 tons, will be slack and prices comparatively weak.

Broadly speaking, the Argentine grain trade is back to normal and is to-day the mainstay of the business life of the country. Farmers have bought the majority of

ARGENTINA

The Agricultural Wealth of Its Provinces



Buenos Aires
7,540,354 cattle
33,328,807 sheep
3,148,283 horses
5,382,250 acres wheat
4,555,000 acres corn

Catamarca
380,356 cattle
216,841 sheep
71,759 horses
43,750 acres corn

Chaco
637,417 cattle
22,003 horses
19,250 acres corn
5,750 acres sugar

Chubut
678,011 cattle
4,437,351 sheep
207,682 horses
12,500 acres wheat

Cordoba
2,109,286 cattle
2,909,935 sheep
1,248,601 horses
5,125,000 acres wheat
11,125,000 acres linseed
1,500,000 acres corn

Corrientes
5,706,971 cattle
5,345,311 sheep
746,172 horses
155,000 acres corn
28,125 acres tobacco

Entre Rios
2,508,501 cattle
6,731,455 sheep
798,899 horses
826,500 acres wheat
1,008,500 acres linseed

Neuquen
276,390 cattle
858,432 sheep
131,086 horses
17,500 acres wheat

Pampa Central
272,390 cattle
6,464,514 sheep
360,451 horses
2,257,500 acres wheat

Rio Negro
351,920 cattle
6,809,795 sheep
228,418 horses
16,250 acres wheat

Salta
851,788 cattle
592,873 sheep
122,805 horses
120,000 acres corn

Santa Cruz
50,167 cattle
4,686,270 sheep
45,564 horses

San Juan
179,998 cattle
185,415 sheep
52,104 horses
17,500 acres wheat
22,500 acres corn
63,000 acres vineyards

San Luis
826,298 cattle
1,309,624 sheep
263,049 horses
115,000 acres wheat
127,500 acres corn

Formosa
363,801 cattle
54,827 sheep
20,278 horses

Jujuy
172,199 cattle
1,014,948 sheep
39,177 horses
26,250 acres corn
24,500 acres sugar

La Rioja
696,939 cattle
213,671 sheep
77,311 horses
8,750 acres wheat
21,875 acres corn

Los Andes
3,000 cattle
127,000 sheep

Missiones
175,016 cattle
405,183 horses
41,250 acres corn

Santiago del Estero
1,173,987 cattle
1,210,891 sheep
261,210 horses
25,000 acres wheat
132,500 acres corn

Santa Fe
4,699,150 cattle
1,676,524 sheep
1,140,253 horses
2,593,100 acres wheat
3,125,000 acres corn
1,391,250 acres linseed

Tierra del Fuego
18,376 cattle
2,100,667 sheep
12,771 horses

Mendoza
358,024 cattle
859,526 sheep
164,961 horses
40,000 acres corn
138,500 acres vineyards

Tucuman
766,088 cattle
240,003 sheep
156,870 horses
102,500 acres corn
227,500 acres sugar

cars sold during the past spring and summer selling season, and they must be depended upon to absorb a big percentage of the comparatively heavy importation of cars now under way.

The livestock industry of Argentina is writhing under the severest blow received during a lifetime. The decline in prices from inflated levels has not only been spectacular but unprecedented in the history of the republic. The general run of cattle, when a demand can be found, is sold at from 5 to 15 per cent of their value a year and a half ago. These, however, are nominal prices, for the supply is far in excess of the demand. Breeders in sections far removed from consuming centers find that the market value of their stock will not pay cost of transportation and many renters face bankruptcy, since the sale of their cattle holdings will not pay a year's rental. Those who during 1920 were owners of thousands of heads and who placed a small mortgage on their stock to expand their business cannot now pay off a $10,000 mortgage which was placed a year ago on stock worth $100,000, even though they sell every animal they have. Under such circumstances it is exceedingly difficult to sell automobiles to cattle men, who make up normally the largest body of buyers in the republic. It is true that some of these during the prosperous times of war-inflated prices made provisions against hard times. However, in Argentina as in other countries, business foresight is not a gift of the many but the rare possession of the few. Consequently the cattle people with cash reserves are the exception rather than the rule.

Time Payments Not Favored

Some importers, in order to stimulate sales, are offering cars on time. This policy is not productive of real results, for so large a portion of the present-day tribulations of Argentine cattle men may be ascribed directly to the alacrity with which they assumed credit obligations heretofore that there is little inclination to take advantage of credit terms. The lack of confidence in the ability of the cattle business to "come back" in the near future is also responsible for the wariness of ranchers in parting with their hoarded cash reserves or assuming any new obligations.

Fortunately in this crisis the cattle interests of the country are finding in the "Banco de la Nacion Argentina" their friend in need. Long time loans are being granted at a low rate of interest and small amortizations. Great leniency is shown in renewals and foreclosures of cattle mortgages are postponed to the very limits of prudence. All manner of artificial remedies have been proposed for righting the situation, but none of these have proved worthy of serious consideration. The recently established Livestock Exchange (Bolsa de Cotizacion de Productos Ganaderos) for regulating prices and trade in livestock and the products derived therefrom is, however, a direct result of the present crisis whose influence for good should be lasting. The National Government is also bending every effort toward finding new markets for Argentine meats, and to this end diplomatic and consular representatives abroad have been authorized to offer loans to foreign governments who are desirous of purchasing Argentine produce.

As matters stand to-day the only hindrance to "business as usual" is this livestock crisis. Once this has disappeared, a lasting reaction will set in and progress will be steady. Little signs of improvement in the meat trade are in sight at present, but it is logical to suppose that Argentine livestock prices will eventually reach the level of intrinsic value which will permit the producer to earn a legitimate margin of profit.

Wool exports during the first quarter of 1922 have been almost double those for the same period of 1921. The enormous surplus held here is gradually being liquidated and the conditions of the market as regards demand and prices are normal. Wool sales, together with grains, have largely been responsible for the rise in the value of the Argentine peso, which has so favorably affected the importation of American cars during the past three months.

The exportation of hides and skins has shown a large increase as compared with last year. The demand is active and prices, which are firm to-day, have a tendency to further strength.

Sound Business During 1922

American manufacturers of automotive products, without indulging in undue optimism, can, however, look forward to a reasonable volume of business during 1922. The financial condition of the country is fundamentally sound. The purchasing power of the people, although temporarily crippled, is not permanently impaired. The steady rise of the peso in its comparative value with the American dollar indicates a healthy reaction in the country's economy. Bankruptcy figures, except where in a given month the failure of one or two large houses run these up, continue to decline.

The agitation attendant upon national elections is now over, and while the definite results are not yet known, there seems to be no doubt as to the final outcome. In the event that the popular conviction is confirmed by Dr. Alvear's election, the country is assured a progressive administration for the coming six years. Argentina has learned much of economy since the middle of 1920; hard work is the order of the day. Unemployment is decreasing and, in fact, has never constituted a real problem here. Money is relatively abundant and interest rates are declining. The gold guarantee for paper currency continues well above 80 per cent. Progress, though slow, is on a sound basis. Once the upward swing gets well under way, Argentina should see a period of development and trade expansion such as she has never experienced. American manufacturers of automotive products can look forward to the growth of their Argentine business with greater confidence than perhaps any other group in the United States.

Popular Priced Cars in Demand

During March 301 American automobiles, 3 chassis and 3 trucks entered the country. Ford cars are not included in the above figures. The local Ford plant assembled and sold an average of 61 cars daily during the month. This constitutes a monthly record and is largely to be explained by the present-day demand for popular priced cars in opposition to more expensive models. During the month 42 European cars, 28 chassis and 8 trucks were imported. The higher percentage of European chassis imported is explained by the local demand for these with custom built bodies. The trucks mentioned were of German origin and were sold due to their low cost in comparison with American trucks. In March, 1921, only 64 American cars arrived here against 22 European. Argentina took 216 cases of automobile accessories during March, 1922.

COMMERCIAL Attaché Arnold reports from Shanghai to the Bureau of Foreign and Domestic Commerce that motor car and tire dealers of China are showing a tendency to standardize on American sizes of tires, and that practically every dealer is instructing his manufacturers to equip any cars shipped to China with American sizes of tires.

Chassis Lubrication

Editor, AUTOMOTIVE INDUSTRIES:

Answering Mr. Frier's letter commenting on your synopsis of Cornelius T. Myers' S. A. E. paper on the subject of "Chassis Lubrication," which was published in AUTOMOTIVE INDUSTRIES for Dec. 1, 1921, I believe the paper itself covers the automatic application of oil in a fairly comprehensive manner.

I cannot agree with Mr. Frier that, as between oil and grease for chassis lubrication, it is a question of "which of the two has given the best results *in the past*" (italics are mine). On that record grease stands under a serious indictment. Neither do the remarks of Mr. Battle (quoted in the letter as advocating a heavy bodied lubricant for heavily loaded bearings at rest) tally with automobile experience. Mr. A. Ludlow Clayden, among others, is authority for the statement that the thinned engine oil, which is ordinarily thrown away when drained from a crank-case, makes an excellent chassis lubricant, and that he has personally used it for years back with very satisfactory results.

As to the unsightly oil cup, I agree with Mr. Frier. It is almost as bad as the grease cup; but I cannot agree that pressure grease fittings embody a satisfactory answer to the chassis lubricating problem. Experience with such fittings has demonstrated that they are far from foolproof for several reasons:

1. They are easily broken off.
2. The dust caps are easily damaged and often lost. Dirt then enters with every new application of grease; and water from the washing hose can also enter.
3. Many of the fittings are in positions awkward to reach and are overlooked.
4. They are not automatic in feeding action.
5. They call for daily attention at many points, and there are few points that should not be fed at least twice a week, if thorough lubrication is to be afforded.

Millions of owners daily demonstrate that they will not be bothered with this attention to chassis lubrication. They will pay a repair bill at the end of a year or so, and this bill is less than what their time is worth. They are far from pleased to pay the bill, however, but it is the less of two evils.

It is not surprising that pressure grease fittings have been widely used. A great deal of money has been spent in pushing their sale, and they are much better than the archaic grease cups. They are comparatively cheap to install and do not call for much change in chassis design. By an extensive advertising campaign the user has been misled into thinking that if grease exudes from a bearing, that bearing is properly lubricated. The user sometimes thinks, too, that the pressure method of grease application is really cleanly and that he will use it regularly. Experience shows that he must still "get out and get under," and when the novelty of the new method wears off he neglects it as much as he neglected the grease cups. Then, too, if he misplaces the grease gun, or damages the flexible connection, he more often than not lets it go until a bearing squeaks or binds and the initial damage has been done.

The answer to the chassis lubricating problem is magazine lubrication, automatically filtered and fed. This means the addition of integral oil pockets to chassis brackets. Fifteen minutes once in 2 or 3 months, 1½ hrs. per year per car will assure thorough lubrication. It will save from $75,000,000 to $150,000,000 per year in repair bills. It will eliminate squeaks and keep springs soft. It will relieve an owner from all anxiety and trouble, because the garageman who puts oil in his engine will oil his chassis at the same time and in the same way—quickly from a spout can.

B. DARRACH, JR.

Percentages

Editor, AUTOMOTIVE INDUSTRIES:

In your editorial column, March 30, under the heading "Percentage," I think you will find you have made an erroneous statement in regard to the percentage of profit or loss on sales. Profit or loss on the sale of goods should always be figured, using the **cost** price as a base, never the selling price. I think you will admit that it is possible to make 100 per cent profit on a sale will you not? Also you will admit that it is impossible to lose more than 100 per cent.

If you double your money you make a profit of 100 per cent, and if you lose your goods or give them away you lose 100 per cent. If you figure the way you state in the editorial, what price would you sell the 80-cent article for to make a profit of 100 per cent?

CHAS. A. SMITH.

Our correspondent is correct. The percentage of profit should be calculated on the basis of cost and not of sale price.—Editor.

Stratified Charge Engines

Editor, AUTOMOTIVE INDUSTRIES:

After reading Mr. Ricardo's paper in the Jan. 19, 1922, issue of AUTOMOTIVE INDUSTRIES, I have watched "The Forum" for comment. Ricardo says "That the highest thermal efficiency is always obtained with an excess of air, about 15 per cent," and "I have always believed that the benefits of working with a weak mixture could be realized by the employment of stratification." Ricardo got a relative efficiency of 64 per cent at a compression ratio of 4 to 1. He got it using a 10 per cent volume of correct mixture and 90 per cent volume of air. The writer cited the above volumes in *The Automobile,* June, 1916, and in *Engineering* (London), June 3, 1921. I recently received a letter from a scientific investigator who says, "After reading your patent I was struck by the fact that Ricardo's recent paper in the *Automobile Engineer* (June, 1921) is largely a corroboration of the results you hope to obtain in your engine," reference being made to the value of stratification and the use of excess air as against a homogeneous mixture.

Now we read of doped fuel, the use of iodine, xylidine and other compounds to stop detonation and make possible the use of higher compressions. Assume that it is possible to increase the efficiency 50 per cent, due to some

dope or compound. This means that the usual grades of gasoline are useless without it, or the engine is. Exhaust gases have been used and air is always available. If an excess of 15 per cent of air is always necessary to obtain the highest thermal efficiency, does it seem logical to use it?

If Ricardo can obtain a relative efficiency of 64 per cent with a 10 per cent volume of correct mixture, using a 4 to 1 ratio and 69 per cent with a 7 to 1 ratio, then it does seem that there is some virtue in stratification.

In view of the above, why advocate dope to improve an engine that operates on a homogeneous mixture when the dope suggested is not always available and when, if it is not available, the engine is useless, unless it is fitted with a device to regulate the compression?

What is the solution? I suggest (1) an engine that uses 15 per cent excess air at the power output required to propel the usual car on high gear and (2) an engine that operates at its highest efficiency at all times, due to gear changes instead of 6 to 60 miles on high and with the result that a 20 per cent efficiency on full throttle drops to 5 per cent on one-third throttle, all due to an obsolete throttle acting on the compression and a carbureter made to deliver a larger fuel ratio when a larger volume of air at constant or higher compression can be used. JAMES MCINTOSH.

Proportion of Unsprung to Total Weight

Editor, AUTOMOTIVE INDUSTRIES:

I should be thankful to know what you consider to be a fair percentage of unsprung weight of the total weight, front and back, of a loaded car and truck. R. A. P.

Some years ago we collected data on the weights of the different components of passenger cars and trucks and averaged them on a percentage basis. This gives us a means of determining the proportion of unsprung to total weight in actual cars. The data upon which these figures were based covered a majority of the cars and trucks on the American market at the time, about five years ago. In determining the proportion of unsprung weight we have assumed that two-thirds of the spring weight is unsprung and one-third sprung, which is about correct for the half-elliptic springs with which most of the cars were equipped.

For passenger cars the front axle unsprung weight figures out to 7.75 per cent of the total weight of the car with fuel, oil and water, and the rear axle unsprung weight to 15.8 per cent. At the time these figures were collected the weights on the front and rear axles, respectively, were not obtained. We have available, however, the weights on the front and rear axles for 15 different passenger cars. The proportion on the front axle varies between 45 and 49.5 per cent, the average being 46.8 per cent, leaving 53.2 per cent for the rear axle. On the basis of the total weight on each axle, the front axle unsprung weight, therefore, is 16.5 per cent and the rear axle unsprung weight 29.7 per cent.

In the case of trucks the weight distribution varies considerably with the load capacity. For instance, in the investigation referred to it was found that in a 1-ton truck the rear wheels weigh 11.43 per cent of the whole truck, while in a 5-ton truck they weigh 20 per cent. In the smaller trucks the proportional weights of the components approach the corresponding figures for passenger cars. We have, therefore, taken the case of the 5-ton truck. The average front axle unsprung weight is 14.20 per cent of the weight of the complete truck chassis, and the average rear axle unsprung weight is 34.87 per cent. The data with respect to weights on front and rear axles of 5-ton truck chassis is somewhat meager, but we have those figures for two such trucks. In one case the proportion of the weight on the rear axle is 58.3 per cent and in the other 59.4 per cent, so we may assume 59 per cent to be a practical average. This gives for the proportion of unsprung weight 34.7 per cent and for the rear axle, 59 per cent.

These figures apply to the chassis only and those given for the passenger car to the car without passengers. You ask for the proportions for the loaded car and truck. These figures may be derived from the above.

Let us take the case of a five-passenger car weighing 3000 lb., of which, according to the figures given above, 1400 lb. would be on the front axle and 1600 lb. on the rear axle. Of the passenger weight four-fifths may be assumed to be on the rear axle, say 600 lb., making the total weight on the rear axle 2200 lb. and that on the front axle 1550 lb. The front axle unsprung weight is then 15 per cent and the rear axle unsprung weight 21.5 per cent. As these figures are based on the weight distribution of 15 actual cars, they may be regarded as representing a consensus of opinion of passenger car designers what the proportion of sprung to unsprung weight should be, considering the limitations imposed by requirements of strength, manufacturing cost, etc.

In the case of the truck the load plays a much more important factor, and the proportion of unsprung weight for each axle depends to a considerable extent upon the division of the load between the front and rear axles. The average American 5-ton truck chassis weighs about 8000 lb., which, according to the proportions given above, gives 3280 lb. for the front axle and 4720 lb. for the rear axle. The body allowance for such a truck is 1800 lb. and the load is 10,000 lb., making together 11,800 lb. Of the weight of body and load one-eighth may be considered to come on the front axle and seven-eighths on the rear axle. This makes the total weight on the front axle 4755 lb. and for the rear axle 15,045 lb. As the unsprung weight in this case would be 1135 lb. for the front axle and 2790 lb. for the rear axle, the front axle unsprung weight is 23.9 per cent of the total weight on the front axle, and the rear axle unsprung weight, 18.5 per cent.

The results obtained are summarized in the following:

PROPORTIONS OF UNSPRUNG WEIGHT, LOADED

	Front Axle	Rear Axle
Passenger car	15.0%	21.5%
5-ton truck	23.9%	18.5%

—*Editor.*

Petroleum Production

INTERESTING figures regarding petroleum production have just been published by the American Petroleum Institute. These figures, which deal with the production of crude petroleum for the years 1920 and 1921, are listed below and for the sake of comparison the figures for our own domestic production have been added:

United States	1921	470 million barrels
United States	1920	443 million barrels
France	1921	392,360 barrels
France	1920	388,700 barrels
From the Basin of Pechelbronn, Alsace.		
Algeria	1921	3,205 barrels
	1920	3,916 barrels
Trinidad	1921	2,354,159 barrels
	1920	2,083,027 barrels
India	1921	6,864,000 barrels
	1920	6,336,000 barrels
Egypt	1921	1,181,477 barrels
	1920	1,042,000 barrels
Canada	1921	173,893 barrels
	1920	196,937 barrels
Provinces of Ontario and New Brunswick.		
Japan	1921	2,438,960 barrels
	1920	2,376,991 barrels
Including Formosa.		

Coal Strike Shows Need for Labor Investigations

When conditions are such as to induce men to stay away from work although starvation faces them, the necessity for some careful analysis is evident. Basic nature of coal industry makes serious its inability to solve problems. Manufacturers should consider conditions in coal industry.

By Harry Tipper

THE attitude of business toward the coal strike well illustrates its general position as regards labor unrest. Although this strike has greatly limited the production of coal for a number of weeks, no important discussion of a public character has occurred, and in very few instances has there been any attempt to investigate the conditions in the coal mining industry of which the strike is partly the result. Both sides of the conflict seem to be equally determined to stand out to the last regardless of the ultimate cost of the proposition or its future effect.

Whether the demands of the labor leaders are unreasonable or not, the conditions which will induce a large body of workers to separate themselves from their work to the point where starvation begins are susceptible to some analysis and some careful consideration. The coal mining business, along with the mining of the metals, is fundamental and the stability of its operations is of great importance to all industry.

So long as the differences between the employer and the worker are bitter and their disputes acute, business cannot reach the stability required for the proper progress, and the other processes of industry are dependent upon a fundamental business that is in itself inefficient and unstable. So long as there is coal in the coal pile and the season for the domestic use of coal has gone by, it is not likely that the general consumer will pay much attention to the matter, but it is somewhat surprising to find other industrial owners so completely indifferent to the progress of the matter or the conditions out of which it arose.

Strikes are symptoms of a troublesome state of affairs in the industrial relations of any organization or industry. This trouble cannot be charged to the labor leader entirely, because the worker is not sufficiently anxious to rob himself of his work without previous reasons of a strong character. All men of observation who have investigated the actions of the workers carefully have found the economic fear of starvation to be one of the most impelling motives in keeping the worker at his job. This fear will keep the difficulties from becoming acute unless they accumulate so that they are amplified and enlarged in the minds of the workers to the point of irritation. Labor discipline is strong in well organized unions. It is strong because the workers find it necessary to have that strong discipline in order to accomplish their purpose. Where there are no grievances, or these grievances are not important, the discipline of the union suffers and workers will not hesitate to stay at work or disregard their leaders if they do not feel that the circumstances warrant the action.

It is unfortunate that the coal industry, because of its basic importance, should be disrupted with such bitter disagreements, and it is a charge against the management in the industry that the labor union should have acquired so strong a hold and that the workers have been forced to such desperate means in the endeavor to support their position.

Some of the publications, in commenting upon this coal strike, have complimented the people of the United States, particularly other industries, on their refusal to become interested in the strike situation. This is only making the matter worse. The effort of every intelligent business man has been at all times to insure the stability of his supply of raw materials and power. Most of the industries of the country are dependent upon the supply of coal for their power and are completely at the mercy of the coal industry for their own profitable continuance.

The principal difficulties in the coal industry for a long time have been those difficulties arising out of the human side of the industry, out of the deficiency of the management from a human standpoint and the acute grievances of the workers, whether real or imaginary. The whole business has been uncertain in many of its conditions for many years, and there is no doubt that the lack of decent agreement between the workers and the owners has affected the cost of producing coal and the profits to be secured from that production.

Activity in business is just reaching an almost normal condition and the prospects are very much brighter than they have been for eighteen months or two years. Unless the difficulty in the coal field is removed, production in business will be delayed by the difficulties in this basic industry. Even if the strike peters out, it will have deferred the difficulty only. It will not have solved the trouble nor will it have put the coal industry on any more stable basis than it has been in the past. It is not likely that the strike will be successful, but it is not likely, on the other hand, that the maximum production in the coal field will be secured for a considerable time.

Furthermore, the difficulties of providing continuous employment, of distributing the product without excessive cost, etc., have not been met and the profits from the industry have not been stabilized. The workers may be wrong in their attitude, their demands may be excessive, but a strike of this intensity does not arise without original

grievance and irritation. In some of the coal mining fields these grievances have been sufficiently bitter to bring about more or less continual warfare between the workers and the representatives of the management.

Strikes which have occurred in other industries within the past few years have been developed strongly and pursued with obstinacy on both sides, but very few of them have been operated with such intensity of difference and bitterness between the parties concerned characterizing this strike. So long as basic industries of this kind remain unstable because of the character of the human organization and the differences arising between workers and management, the very fundamentals of the industrial system are in such a position that the manufacturer cannot depend upon the stability of his source of major supplies. Regardless of his belief, every manufacturer is deeply interested in the difficulties in the coal business, and that interest should be toward a definite consideration of its conditions.

Worm Variable Reduction Gear for Single Unit Electric Sets

A RATHER novel reduction gear for combined generators and starters is described in a recent issue of *Engineering*. It was invented by E. C. Hatcher and is being developed by the H.-R. Reduction Gear Syndicate. The gearing, which consists entirely of worms and worm wheels, transmits the power direct when the dynamo machine is acting as a generator, whereas it passes through three pairs of worms and worm wheels when the machine acts as a starter. An advantage of the mechanism is that it does away with the necessity for the usual large gear ring on the flywheel, but it would seem that the transmission of the starting power through three successive worm and wheel combinations would entail a considerable loss of power.

The principle of the gear is illustrated diagrammatically in Fig. 1. The driving shaft is direct-connected to the motor generator. The worm *C* is not fixed to the driving shaft, but slides on a key thereon, its movement being limited to a range of about ¼ in. by a collar on the driving shaft on the side of the worm *C* remote from the driven shaft. On the face of the worm *C* nearest the driven shaft dog clutch teeth are formed. Similar co-acting teeth are provided on the adjacent end of the driven shaft, which for this purpose is enlarged and bored out to accommodate loosely the end of the driving shaft. To start the car, energy is supplied to the motor generator, the power being transmitted through the gearing at a slow speed to the driven shaft and thence to the engine. While the motor is thus driving the engine the thrust on the worm *C* is such as to move and hold the worm against the collar on the driving shaft. When, however, the engine picks up its speed the worm wheel *F* tends to overrun the worm *C*, the direction of the thrust on the latter is reversed, and it slides forward on its key until the clutch teeth come into engagement. The motor generator thus becomes directly coupled to the engine, and instead of driving it is driven by it. It therefore changes its function to that of a generator and charges the lighting batteries. In order that this arrangement may be made effective it is necessary to mount the shafts *A B* and their worms and wheels in a frame that is free to rotate in one direction inside the casing inclosing the whole gear and prevented from rotating in the opposite direction. To this end, when the motor is driving the engine, the frame is prevented from turning in the direction opposite to that in which the motor armature rotates by means of six friction balls lying against cam faces inside the casing and nipping against a plain cylindrical surface on the frame. When the engine is driving the generator directly, the balls moving on the cam faces release their grip on the frame and allow it and the shafts *A B*, etc., to rotate at the same speed and in the same direction as the coupled driving and driven shafts. It is to be added that the cam faces are formed on the inner circumference of a ring held within the casing by two spring plungers. Should the engine backfire during the starting period the plungers allow the ring to slip and thus damage to the ring, balls or frame is avoided. It may also be noted that an additional shaft connected through worm gearing to the driven shaft is provided. This shaft is intended for driving the magneto or speedometer. Fig. 2 illustrates the general arrangement of the gearing portion.

The application of the system to motor car lighting and starting as described above represents the original object for which the gearing was invented. It was, however, soon appreciated that the field for its employment could be greatly extended, and a four-speed and reverse transmission gear on the same principle has been designed.

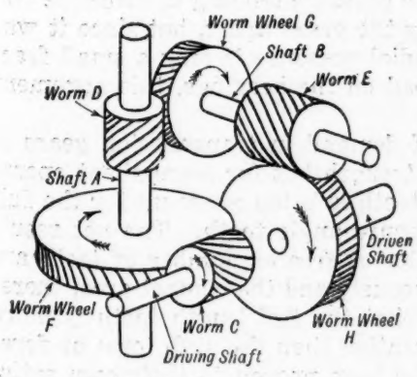


Fig. 1—Diagram of H-R reduction gear

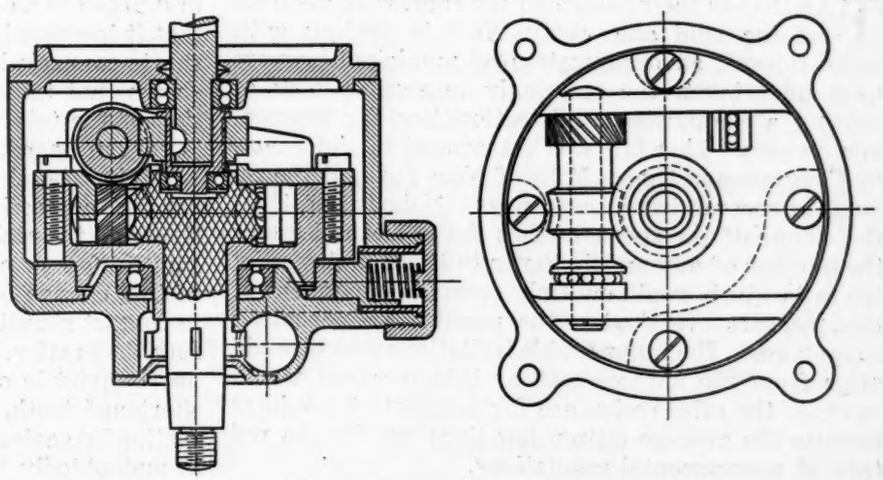


Fig. 2—Gear designed for combined generators and starters

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Capitalizing Crime

TAKING as their precedent the repressive methods of the wild and wooly West in dealing with horse thieves, an organization of municipal lawyers have undertaken the seemingly impossible task of writing a compulsory registration law for automobile owners. This bill was introduced in the House by Congressman Ogden Mills of New York, at the request of several district attorneys. Nobody questions the claims of the sponsors that the bill would lessen the number of automobile thefts in this country. Yet the evils which would multiply from the enactment of this measure overshadow the possible compensating advantages. The innumerable irritations which would arise from the enforcement of this proposal would increase the sales resistance for automotive products because the average citizen has little use for the red tape of governmental regulations.

Witnesses testified before the House Committee of the Ways and Means Committee recently that there would be difficulties for manufacturers, who would be obliged to obtain Federal numbers for their products.

The Mills Bill proposes to assess a registration fee of $2 on all motor vehicles. It would be necessary to have number plates on the car and engine. As an illustration of the wrath-provoking tendencies of the bill, an owner of a car would be subject to arrest in event a garage man or dealer had loaned an engine during a period of repairs. If the number on the borrowed motor did not correspond with the chassis number, the operator of the car would be arrested and fined.

It is easy to imagine the wholesale arrests which would follow the enforcement of the Mills Bill. Thefts of motor vehicles can be prevented whenever we have judges and juries who will enforce the law as it now exists on the statute books. The claim of the sponsors for a precedent in the branding of horses is indefensible, as Congressman Garner of Texas emphasized when he declared that thefts of horses were stopped in Texas by the liberal application of the Judge Lynch formula—the noose.

Full Length vs. Stub Gear Teeth

THE stub tooth, which has been extensively used in automobile transmissions during the past fifteen years, was evolved to meet the requirement of increased strength. A gear tooth is generally considered as a cantilever beam loaded at the end, and it is therefore obvious that the strength of the tooth increases with increasing root thickness and as the height of the tooth decreases. To increase the root thickness, the pressure angle was increased from the 14½ deg. common in industrial gearing, to 20 deg.; and in order to decrease the tooth height, the working depth for any particular pitch was made the same as the standard working depth for a pitch one or two numbers higher. This gave such pitches as 4-5, 5-7, 6-8, etc., in which the first figure is an inverse measure of the pitch, and the second a measure of all radial dimensions of tooth elements.

In this way the strength of the teeth was materially increased, and one of the results has been a reduction in the size of automobile transmissions. It was at first urged as an objection to the 20 deg. pressure angle that it increased the pressure tending to force the two shafts connected by the gears apart, but since it was shown that this radial pressure is only a small fraction of the total load on the bearings, this argument is seldom heard.

To-day the chief demand in transmission gears is not for increased strength but for more silent operation, and the stub tooth is being given up for the full length 20 deg. pressure angle tooth. The net result of this change is that a greater number of teeth are in contact simultaneously and the contact area, therefore, is greater. That the full length tooth is more nearly quiet in operation than the stub form or foreshortened tooth, has been proven to their own satisfaction by various manufacturers, and the explanation is undoubtedly the greater amount of tooth contact surface and the consequent more effective action of the oil cushion.

Building Motor Transport Progress

BOTH the motor bus and the motor truck have an economic place in our transportation system. Since the commercial and engineering development of these units has been comparatively recent, however, the exact scope of their activities has not been accurately defined. Considering the youth of these new transportation mediums, there is nothing startling in the fact that each of them is groping to a certain extent at the present time to determine the methods and conditions under which it can operate most efficiently and how it can co-ordinate with existing transportation facilities.

In the long run, the bus and the truck will handle just as large a part of our transportation as can be justified on the basis of economy and efficiency. This outcome is certain. Just what proportion this part will be cannot be determined with any degree of accuracy on the basis of the data available at present. Research studies and practical experience are combining, however, to define the scope and function of these motor transport units, and progress is being made.

In the meantime there is a natural tendency on the part of existing transportation organizations to fear the competition of the truck and the bus and to attempt to arrest that progress through the erection of artificial barriers to normal economic progress. Such a tendency is natural. The necessity for profits on investments already made constitute the basis for consideration on the part of existing transportation agencies rather than a pure consideration of the economic transportation needs of the community.

The public at large is primarily interested, of course, in getting the best transportation at the lowest cost. It will not permit the permanent exclusion or hindrance of any transportation unit which will help achieve that goal. The fundamental power of economic law will finally be the determining factor.

But the artificial barriers set up in the meantime will have the effect of lengthening the time necessary for these economic laws to begin to function freely. Individual difficulties will probably continue to arise in various parts of the country for some years to come. The difficulties are and will be largely local in character and can best be met by local bodies in specific cases.

It is just as natural that there should be opposition to bus and motor truck development as it was that there should have been opposition on the part of stage coach lines to the development of railroads, and opposition on the part of organized labor to the introduction of machinery in manufacturing processes. The natural opposition of the older order to the development of the new builds up certain artificial obstacles in the path of the latter which, while they may be only temporarily effective, do have a decidedly retarding influence and should be offset to the greatest possible degree.

Every manufacturer of buses must expect to meet opposition from certain sources, which can be easily anticipated, and every dealer selling buses must be prepared to meet the natural opposition which will eventually arise when these buses are put into service.

Destructive opposition to truck and bus transportation can best be met in general by constructive education. As more knowledge is gained as to the true function of motor transport, its advocates will be better able to point out specifically how existing transportation agencies can be supplemented and helped by the bus and by the truck. In many instances, existing agencies will be greatly benefited by the coming of motor transport as a feeder.

In some places the bus will replace the electric railway eventually, regardless of artificial barriers, and time and money is simply lost in the erection of such barriers. In still other cases, the electric railway will be found to be the most efficient transportation unit and the bus will not be suitable. Frequently a correlation of both units will be found to be the most practicable.

The possibilities of mutually beneficial co-operation between the truck and the railroads are even more obvious. Studies have already been made showing that the railroads do not profit from the transportation of certain types of freight over short distances and that the truck is a better unit in these cases. The profit potentialities of store-door delivery, if organized by the railroads, appear to be good.

The advantages of co-operation and correlation have already been recognized by many electric railway and railroad interests and considerable impetus is being given to truck and bus development through that recognition. The growth of this broad-gage attitude is practically assured, although too rapid progress cannot be expected. Automotive interests can best serve their own ends, as well as those of the public, by playing a constructive, rather than belligerent, part in the development of the truck and bus as transportation units.

Dealer Reports Show No Let Up in Sales

Impression Gains Ground That Some Plants Will Be at Capacity All Year

By JAMES DALTON

NEW YORK, May 16—Reports from dealers in all parts of the country show that no sign of slackening in the demand for motor vehicles is apparent. Producers are exerting every effort to turn out this month more cars and trucks than were made in April. In most cases output will be circumscribed only by plant facilities. Total production for May is almost certain to exceed the high mark set last month.

While it still seems likely that there will be a decline of sales in the third quarter, the impression is gaining ground that some companies will find business so good they will be able to operate their factories practically at capacity the entire year. Each manufacturer hopes he will be able to keep in this class.

General Motors Corp. expects the third quarter to be better than the second in the sale of its three most popular lines. Henry Ford finds the outlook so encouraging that he has abandoned certain plans he had in mind early in the year for using surplus factory space. He has no surplus space now and there are no indications that any will be available this year.

Foreign Demand Increasing

One striking feature in connection with the extraordinary sales of motor vehicles in this country has been the almost simultaneous increase in foreign demand. Ford's foreign assembling plants are establishing new records and General Motors reports large gains in sales, especially in Great Britain. Demand also is much better in Brazil, Argentina, Spain, Denmark, France and other countries.

Output of closed passenger cars still is handicapped by a body shortage although body makers are resorting to all kinds of expedients to enlarge their production. One of their serious difficulties is the shortage of skilled labor. Another influx of workers is under way at Detroit although there is plenty of unskilled help.

Cars of the closed body type are in greater demand this year than ever before. In some cases it is 50 per cent of the output. The new type of soft top, glass inclosed vehicle is most popular. This is the result of materially lower prices in comparison with the former cost of closed models.

Business in Brief

NEW YORK, May 16—Better weather and crop conditions, more activity in retail trade, continued improvement in industry and a larger export business constitute the more favorable developments of the last week. The stock market is somewhat reactionary and apparently is waiting for the industries, whose improvement it has more than discounted, to catch up. The automotive industry is leading all others, and it alone appears to be ahead of the stock market in its advance.

Production of steel ingots for April was at the rate of 36,500,000 gross tons a year, as compared with a rate of 30,000,000 tons at the beginning of March. This shows an increase in production since the coal strike began, but the rate of gain has been slowed up. Additional plants are resuming operations, however.

Lumber and other building lines continue their activity.

Agricultural implements are selling more readily as the season progresses.

The latest government crop report confirms improvement in winter wheat.

Machine tools are selling better to railroads and automobile manufacturers.

Apparel trades have lagged at wholesale, but retail buying has been heavier.

Increased loadings of freight cars, exclusive of coal, continue steadily.

Bonds are less active, money is easier and sterling exchange is higher.

Bank clearings for the week ending May 11 were $7,185,030,000, a loss of 9.7 per cent from the previous week, but a gain of 24.2 per cent over the same week last year.

A survey made by the Federal Reserve Board indicates a much brighter trade outlook for the country as a whole.

Except for the body situation, the parts shortage is not so serious as it was last month because parts manufacturers have been speeding up production. Collections are highly satisfactory and all but a comparatively small percentage of bills are being paid when due.

Factories turning out the more popular lines of passenger cars have enough orders booked to keep production at the present pace for several weeks. Distributors in agricultural districts are placing orders for July 1 delivery to take care of demand from farmers which is expected to show a sharp increase at that time.

Truck Gains Shown In Engine Schedules

Steady Increase Forecast—Capacity Car Production Likely to July 1

By D. M. McDONALD

DETROIT, MICH., May 15—The Continental Motors Corp. reports that production of its light six engine now is about equal to that of its other passenger car models. Starting in January of this year, when the new engine was first shown mounted in cars of several makes, the production has expanded steadily until it now is on an even basis with the older Continental models.

The company is now abreast of requisitions on practically all models, including the light six, an official declared, through the completion of additions at the Muskegon plant and installation of equipment. The Muskegon plant is essentially a four-cylinder plant and will figure most prominently in the production of engines for both the Durant and the Star. Four-cylinder truck engines are also made at the plant.

Foundries supplying the Continental factories are about caught up with deliveries and for the first time in several months the plants will be enabled to set up a small store of advance material. In reaching its present production stride the company doubled several times the number of men employed a few months ago and will make additions as fast as mechanics can be obtained.

Steady Business Evident

Production schedules as outlined call for the largest output the company has ever known. Truck business is growing by leaps and bounds and is already an important factor in the Continental gross business. On the basis of reports received from its customers, there will be a steady business throughout the year in both car and truck lines, with the latter increasing every month.

Manufacturers in the Detroit district as a whole are making a very close study of the general business condition of the country and the possibility of continued heavy absorption of automobiles. Capacity business to July 1 in most factories is assured now by the orders on hand. As a general rule, it is believed that with proper merchandising effort on the part of the dealer, a very strong measure of business will continue during the year.

Intensive sales development is the order of the day at the factories. Those companies which have developed strong dealer organizations are busy now with plans which will keep those organizations functioning at the highest point of sales efficiency. In the carrying out of these plans there will be little left to chance. Multiplication of sales forces and dealerships are being carried out in many localities to make certain that the districts are fully covered.

(*Continued on page* 1087)

Plans Are Approved of New Moline Plow

Reorganized Company Starts Business with Current Assets of $16,000,000

MOLINE, ILL., May 15—Reorganization of the Moline Plow Co. and its subsidiaries is complete, and plans for its future program have been ratified, according to an official statement from the company's offices. "The financial housecleaning was done with unusual thoroughness," the statement asserts.

Certificate of change of name to the Illinois American Plow Co. was filed with the secretary of state last week. It is understood, however, that this action later was reconsidered and that the name will not be changed, the company preferring to operate under the title by which it has been known to the trade for 60 years.

The reorganized company starts with $16,000,000 current assets and, except for $70,000 current accounts and the accrued and current expenses, has cleared indebtedness from its books. Conversion of $25,000,000 indebtedness into 20-year debentures and first preferred stock in equal amounts was a feature of the refinancing. Former first preferred stock to the amount of $7,500,000 was converted into an equal amount of second preferred issue under this plan.

Vigorous readjustment and conduct of business has been ratified by the directors, and the new plan, which, it is promised, will lower implement prices to the farmer, is "dedication of the company to a policy of improvement in implement distribution," according to George N. Peek, president.

Peek further said:

Implement sales to farmers have been on a system suited to frontier development before good roads, the parcel post and the automobile. We have had too many small dealers at cross-roads and not enough strong distributors in natural trade centers — too much factory canvassing, small shipments and too long terms. Too large a part of the price of the implement represented the cost of getting it to the farmer. Our new plan cuts out the waste of distribution. It will leave more of the profit of sales in the community where it is achieved. It will pull business by attractive discounts rather than push people into buying by weight of sales force.

Lea Continues With Stephens

Chief of the subsidiary companies affected by the reorganization is the Stephens Motor Car Co., with factories in Freeport. R. W. Lea continues as general manager of the subsidiary. Commenting upon the inauguration of the new plan, he said:

We are signalizing the reorganization with a price cut which averages $130 a car on all models. No company is now more firmly established and our whole organization from factory to dealer is enthusiastic. This cut and the reception of our car in all parts of the country assures us a great jump in business and popularity.

Frank O. Wetmore, who headed the committee which completed plans for the reorganization, remains as chairman of the board of directors; George N. Peek is president; H. S. Johnson, executive vice-president; R. W. Lea, vice-president and general manager of the Stephens Motor Car Co.; F. W. Edlin, vice-president and sales manager; C. B. Rose, vice-president in charge of the tractor works; H. B. Dineen, vice-president in charge of implement manufacture; L. C. Shonts, secretary; L. C. Blanding, assistant secretary; F. J. Hoenigman and John Hammerich, assistant treasurers.

The board of directors includes Wetmore, Peek, Johnson, John E. Blunt, Jr., C. P. Coffin, Herman Waldeck, F. F. Winans, all of Chicago; S. A. Mitchell and J. Herndon Smith of St. Louis; Rumsey W. Scott, Henry R. Johnston and R. I. Barr, all of New York City; C. Jaffray of Minneapolis, Horace Fortescue of Philadelphia and H. H. Cleaveland of Rock Island.

IOWA BUYS HIGH PRICED CARS

MARSHALLTOWN, IOWA, May 16—More high priced cars have been sold in Marshall county in the last two months than in the same period in 1921 and 1920, according to the county treasurer.

Increased Production Is Based on Sound Upgrade in Business Conditions

By EDWARD S. JORDAN,

President of the Jordan Motor Car Co., Inc.

Cleveland, May 15.

THE present increased production is based upon a sound upgrade in the curve of general business. While it is not anticipated that production will proceed at its present rate after July 1, there is no indication that a slump will occur after that date. Rather the curve of production will more closely align itself to the business graph which is on a steady, normal, upward slant.

It is certain from the present outlook that the industry will easily exceed the peak production of 1920. In that year about 1,940,000 were made. In 1922 production will go well over 2,000,000. As the year unfolds itself month by month business prospects look better. While local conditions in certain spots in the country are still bad, these points are in most instances quite isolated and often immediately contiguous to prosperous territory.

People who have sold their higher priced cars during the period of depression and contented themselves with others below the price class to which they have become educated and accustomed are starting to come back. This bit of human nature is of tremendous importance in the volume of production and sales. The trend is always upward unless business reverses cause it to be otherwise, and then as soon as the reverses have been overcome, the owner goes back to the type of car to which he has accustomed himself.

This is a period of education in closed car conveniences and comforts. The coming business in closed cars is going to be tremendous. Increasing business prosperity as indicated by the general advance in business volume in practically all lines is increasing the number of prosperous prospects who are moving up in the price class and also introducing new prospects into the lower-priced fields. One of the big factors of to-day is the fact that 80 per cent of the cars sold are on a time basis.

The sales at the present time are in the industrial centers; the farmers have not yet started to buy in anything like the volume that they will in the future. The demand, however, without any real assistance as yet from the farmer, has overrun the ability of the industry to produce at this time. On a majority of model types the factories are behind on orders which, of course, accounts for the production curve being at its present height. In April, the industry produced 213,000 cars and trucks. May will exceed this. At the rate of May production the industry would produce 3,000,000 per year. This is just a little too many automobiles for this year, but the total figure will go over the 2,000,000 mark.

Trustees to Begin Sale Of Parenti Assets May 23

BUFFALO, May 16 — The Marine Trust Co., trustees for the Parenti Motors Corp., will begin selling the property of the concern on May 23. This announcement was made yesterday by letters to stockholders of the Parenti firm.

Frank M. Hickok of the Marine Trust said that the property, appraised at $388,000, exclusive of stock and raw materials, is all of the tangible assets to show for more than $3,000,000 worth of stock that has been issued to more than 11,000 stockholders.

A month ago the Marine Trust Co. took the assignment of the Parenti concern at the request of the board of directors of the company, who hoped to avoid waste, delay and expenses involved in bankruptcy proceedings.

The letter states that the directors have been unable to do anything apparently and that they and representatives of stockholders refused to put more money into the proposition in an effort to rebuild the organization. The letter calls attention to the fact that if the property does not sell for enough to pay the debts, the stockholders will lose everything.

Spicer Makes Offer for Hartford Parts

Will Form New Company and Pay $220,000 Cash to Creditors Committee

HARTFORD, CONN., May 15—The creditors' committee of the Hartford Automotive Parts Co., which bid in the property for $350,000 at the recent receiver's sale, announces that the Spicer Manufacturing Co. has offered to purchase all the assets and property except the real estate and buildings and the outstanding accounts receivable.

The Spicer Manufacturing Co. will organize a new corporation and will pay $220,000 in cash to the creditors' committee. Of this amount, $120,000 will be raised by the Spicer company on the notes of the new corporation, which is to have a capital of $330,000 of 7 per cent preferred stock and $100,000 of common stock. The creditors' committee will receive $230,000 of the preferred. The creditors' committee will retain all of the real estate and buildings, but will lease to the new corporation about one-third of the area of the present plant.

The proposed agreement with the Spicer company provides that no dividends shall be paid upon the common stock until after the preferred has been retired and that after the notes for $120,000 have been paid 50 per cent of the net earnings of the new corporation shall be deposited to retire the present stock.

The creditors' committee urges that this plan be accepted.

Smith & Gallatin Acquires Large Interest in Mercer

NEW YORK, May 15—A large interest in the Mercer Motors Co. has been acquired by Smith & Gallatin and their associates. George P. Smith has been elected a director of the Mercer company and will represent these interests on the board.

A special committee of directors of the Mercer company has been appointed to confer with the new interests in regard to strengthening the position of Mercer. This committee consists of former Governer Stokes of New Jersey, Walter G. Kimball, vice-president of the Columbia Trust Co., and John Davis, vice-president of the Liberty Industrial Corp.

A. J. Drefs, vice-president of the McQuay-Norris Manufacturing Co. of St. Louis, who is widely known in the automotive industry, is associated with the new interests, and will take an active part in Mercer affairs in an advisory capacity.

NORTHWAY SEEKS FUNDS

BOSTON, May 15—Directors of Northway Motors have decided to ask stockholders to subscribe $400,000 in cash, which will be required to continue the business. The assets of the company are estimated at $2,000,000, consisting of the plant at Natick, machine tool equipment valued at $935,000, and the inventory priced below present market costs. The liabilities total only about $100,000, but additional working capital must be obtained if operations are to be continued. The company has discontinued the manufacture of the passenger car and is concentrating its efforts on the Northway truck.

Wood Wheel Association Names White President

CHICAGO, May 15 — Thomas A. White, president of Crane & MacMahon, Inc., Saint Marys, Ohio, has been elected president of the reorganized Automotive Wood Wheel Manufacturers Association. C. F. Field, general sales manager of the Hayes Wheel Co., Jackson, Mich., has been made vice-president. Trustees, in addition to the president and vice-president, are C. C. Carlton, secretary of the Motor Wheel Corp., Lansing, and S. Vance Lovenstein, president of the Schwarz Wheel Co. of Philadelphia.

The association is very much interested at this time in studies which have been made of the wearing qualities of solid rubber tires on wood wheels and of steel wheels used on trucks. The inquiry is said to show that solid rubber tires last longer and give greater service on wood wheels.

Miniger Plans to Control Auto-Lite When He Buys It

NEW YORK, May 15—C. O. Miniger, one of the receivers of the Willys Corp., who is in New York for a series of conferences this week, expects to be successful in his bid for the property of the Electric Auto-Lite Co. when it is sold May 29. He states that if his bid is accepted he will be in control of the company and that no automobile manufacturer will be associated with him. The Auto-Lite plant is now operating practically at capacity. Sales of farm lighting outfits are increasing rapidly. Business in this field for the first 11 days of May equalled the entire month of April.

Miniger stated to-day that the affairs of the Willys Corp. are being worked out in a way which is gratifying to the receivers and that negotiations now are under way for the sale of the New Process Gear Corp. of Syracuse. He declined to state what interests were seeking this property.

LINCOLN OBJECTIONS FILED

DETROIT, May 16—The Detroit Trust Co., as receiver for the Lincoln Motor Co., has filed objections in the United States Court to the War Department's claim of $9,000,000 for alleged over-payment of war contracts. The bill stated the receiver has not been fully informed of the nature of the Government's claim and urged that all claims should have been presented in 1919, when an agreement was reached on the contracts and settled in full.

Creditors Purchase Maibohm for $110,000

Will Turn Property Over to Arrow Motors Co., New Sandusky Company

TOLEDO, May 15—The Maibohm Motors Co., Sandusky, was bid in for approximately $110,000 by E. G. Kirby of the Commerce Guardian Trust and Savings Bank, this city, chairman of the creditors' committee, at sale in bankruptcy conducted by Referee Fordyce Belford at Sandusky to-day. There were no other bidders for the plant.

The creditors' committee, which held authorizations to act on behalf of more than 80 per cent of the creditors, will turn the property over to a new Ohio company, known as the Arrow Motors Co., Sandusky, in accordance with the plan previously approved by the creditors.

The new company is composed largely of the Sandusky interests which had been identified with the old company as stockholders and creditors. It will have an active working capital of approximately $200,000 and assets of $700,000, and, in addition, the complete co-operation of the creditors. This capital is expected to put the company firmly on its feet.

None of the officers of the old company will be identified with the new company. E. C. Burch will become president and general manager of the Arrow Motors Co., and E. G. Kirby will also be identified with it when a permanent organization is effected.

The new company will start to work immediately on a refined Maibohm, which, it is said, will sell in the $1,500 class.

Simplex Was Mentioned

NEW YORK, May 15—It was reported at the time the sale was pending and when efforts were being made to reorganize the company that New York bankers were considering a $500,000 bond issue and a stock issue of at least that amount contingent upon the acquisition of the rights to manufacture the Simplex car now owned by the Mercer Motors Co., but not being produced at the present time.

H. C. Maibohm, who organized Maibohm Motors, was active in efforts to reorganize the company and was understood to have obtained an option on the Simplex assets. The plan as outlined at the time was to discontinue production of the Maibohm and produce an entirely new car, embodying many of the Simplex features but selling at a price radically lower.

Arrow Motors Co. Incorporated

SANDUSKY, May 13—The Arrow Motors Co. has been incorporated to take over the plant and other property of the Maibohm Motors Co. here in the interest of creditors and local stockholders. The incorporators are Joseph G. Pyle, M. N. Osborn, C. R. Spahn, E. B. King and E. C. Burch, all of this city.

Germany Will Build Dirigible for U. S.

Council of Ambassadors Grants Credit of $750,000—Ship Bigger Than ZR-2

NEW YORK, May 11—Representatives in this country of the Zeppelin interests have been informed that the Council of Ambassadors has decided to grant the German Government a credit of $750,000 for the construction of a dirigible of the newest type which will be turned over to the United States Navy. The funds used for the construction of the huge airship, which will be larger than the ZR-2, will be credited in gold marks to the German reparations payments.

The American Zeppelin agents have been informed that before the dirigible is delivered to the Navy Department it will be flown across the Atlantic 12 times to demonstrate its airworthiness. The new Zeppelin will be the last word in German airship construction because the fate of that branch of aviation in Germany will depend very largely upon its success.

If the navy Zeppelin works out as successfully in its tests as it is expected to do, construction of similar airships for commercial use in this country will be undertaken at once. They will be designed to carry both freight and passengers, and the ultimate purpose is to establish a line from the Atlantic coast to the Pacific.

The United States is the only one of the principal allies in the World War which failed to receive a reparations airship from Germany. England, France, Italy and Japan each received a dirigible of the Zeppelin type. Vigorous representations were made by the United States Government to the Reparations Commission and as a consequence the Council of Ambassadors now has granted the credit to the German Government for the construction of a ship of the same general type.

Schuette Sues Zeppelin Company

NEW YORK, May 15—An Associated Press dispatch from Berlin says:

An action alleging libel has been instituted by Prof. Johann Schuette of the Schuette Lanz Airship Co. against the Zeppelin company.

The Zeppelin concern is said openly to have insinuated that Prof. Schuette's agreement with the General Air Service of America probably would reveal the unconditional surrender to foreign interests of notable German inventions, and further to have claimed priority rights to patents not now controlled by Schuette.

The Zeppelin concern intimates that it shortly will proceed legally to establish its right to the patents in question. It hints that the American corporation probably will be called on to contest the suit, as the patents on which it claims to own control probably are the same as those registered by Schuette in Germany, which largely "constitute the intellectual property of Count Zeppelin."

The forthcoming suit is expected to involve litigation by both the German airship concerns over patents which for a long time have been the source of hostility between them. The Zeppelin concern recently concluded an alliance with Spanish and American financial interests with the purpose of founding a transoceanic air service.

While in the United States recently, Dr. Schuette said that he had signed contracts which would give the General Air Service Co., which includes in its directorate men prominent in the General Electric Co., the manufacturers' rights and patent interests in the Schuette-Lanz airships for the entire world. He asserted at that time that these rights would give the United States the leading position in aeronautics.

Special Sales Dispose of Last of Briscoe Line

DETROIT, May 16—Earl Motors is closing out the last of its Briscoe line through the medium of special sales which will be held in cities within easy delivery distance of the Jackson factory. Sales in Cleveland and Detroit have resulted in a heavy business which has practically closed out the last of the roadster model, leaving only a limited number of phaetons and closed cars. These are expected to go within the week.

The phaeton, equipped with front and rear bumpers and with side windshield wings, sold in Detroit for $675 and the closed models for $1,000. Service on the car is guaranteed and will be handled through the regular Earl dealer organization.

Good Roads Association Backs Frelinghuysen Bill

WASHINGTON, May 15—One of the sponsors for the Frelinghuysen resolution providing for the reimportation of motor equipment now used by the American army in Germany, is the Lee National Good Roads Highway Association. According to a statement of M. Johnson, general manager of the organization, the motor equipment is needed to reduce the cost of highway construction throughout the country.

Johnson has estimated the value of all motorized equipment owned by the War Department in Germany at $200,000,000, but this figure is questioned by Government officials, who claim that there are less than 500 trucks and passenger cars along the Rhine.

Old Obenberger Trustee Makes Final Accounting

MILWAUKEE, May 15—Unsecured creditors, with aggregate claims of $490,457, probably will realize nothing from the winding up of affairs of the John Obenberger Co. of Milwaukee, bankrupt. The final account of J. F. Gerdis, trustee, shows income of $363,974 and disbursements of $334,808, leaving a balance of $29,166. Against this as a preferred claim is the unpaid Federal income tax for 1918, amounting to $64,393, so that nothing is left to reimburse unsecured creditors.

Wisconsin Used Car Bureau Is Dissolved

Action Taken Voluntarily After Attorney General Ruled on "Anti-Trust" Phase

MADISON, May 15—Attorney General William J. Morgan's ruling that the Wisconsin Automotive Statistical Bureau, an organization of automobile dealers, was in violation of Wisconsin's anti-trust laws, has resulted in the corporation's voluntary dissolution.

Articles dissolving the bureau were filed with Secretary of State Elmer S. Hall this week. This action brought to a close what was characterized by Attorney General Morgan, in an opinion recently on the bureau, as "a combination to control the used car market."

The articles of the bureau declare its purpose to "efficiently collect from among the members of the automobile trade reliable information pertaining to the automobile industry and the exchange and dissemination of the same to promote the industry."

A conference with the officers of the bureau was held by Morgan, in which he asserted that their association was an attempt at price fixing and was incompatible with the laws of Wisconsin. The dealers considered this contention, and this week withdrew their incorporation papers. Morgan had told the dealers that unless they dissolved he would institute court action.

Price List Prepared

At the time of the conference Morgan produced a price list bearing the bureau's name, which he declared was issued by the association. It contained price lists for every make and model car for the past five years.

Morgan was reluctant to make any statement on the dissolution, which was made public through a daily statement issued by the secretary of state giving incorporations and dissolutions. He explained that the purpose of his department was to correct conditions without taking drastic action if possible.

Klaxon Co. Asks Lower Freight Rates on Horns

WASHINGTON, May 15—The Intertate Commerce Commission has given a hearing on the complaint filed by the Klaxon Co. of Newark, N. J., against the Alabama Great Western Railroad and 40 other railroads, regarding the present freight classification of horns used as warning signals on automobiles, motorcycles, motor boats, etc.

The Klaxon company asked that the rate be reduced from 1½ times first class rate in less than carload lots to the first class rate, and from the second class rate on carloads to the third class rate. If the claim is allowed it will result in a considerable saving in freight charges for automobile manufacturers.

Ford Sales in April Exceeded Estimates

Increase Due Chiefly to Unexpectedly Greater Business in Foreign Countries

DETROIT, May 15—April sales of Ford cars and trucks in both the United States and foreign countries totaled 127,249, according to the revised figures just disclosed by the company. This exceeded the schedule of 120,000 fixed by the company as the April figure and indicates an unexpectedly increased demand in foreign business rather than in sales within the United States.

The former previous high record month, June, 1921, was exceeded by 15,467. The May figure has been fixed at 135,000, and preparations are already being made in the purchasing department of the company to prepare against an output of 150,000 in June. Even with an output of 135,000 in May, there will be approximately 30,000 orders carried over into June. Daily average sales in the United States reached a total of 5210 at the end of April. Production for the year is expected to reach 1,100,000, a 10 per cent gain over 1921.

Fordson tractor sales in April totaled 11,181, a daily average of 469 being reached by the end of the month. This is a new high sales record for tractors and shows a 100 per cent gain over the best month of 1921. Truck production and sales approximate 10 per cent of the Ford business, giving an approximate sale in April of 12,725.

Price Cuts Helped English Sales

DETROIT, May 12—Recent price reductions on Ford cars and trucks in England have brought sales to a high volume, the company now operating on a scale which has not been equaled since 1920 and which is reported advancing to new high record points. In one week in March the output and sales total reached 1009.

Production at the Copenhagen plant in March approximated 800 vehicles, this being a higher total than for any month in 1921.

In South America sales are reported running higher than in 1920, despite the handicaps of poor road facilities. In the first three months of this year 3465 Ford cars and trucks were absorbed in the Argentine market alone, a considerably higher number than for any similar period. Importation of American cars and trucks into the Argentine is said to outnumber European imports three to one.

The company reports an extensive road building program undertaken by the city of Sao Paulo, Brazil. Rio Janeiro business is reported handicapped by the poor roads outside the city.

Orders Dry Kiln Equipment

INDIANAPOLIS, May 15—The Ford Motor Co. has placed an order for 66 carloads of dry kiln equipment with value in excess of $200,000 with the National Dry Kiln Co. of this city. The order, said to be one of the largest single orders for kiln equipment ever placed, is to be shipped to the Iron Mountain plant of the Ford company.

The total dry kiln equipment made for Ford by this local concern will amount to 140 carloads when the last of the present shipments is made. The first order was received September, 1919, and was for the River Rouge plant. The Highland Park and Hamilton plants have also had equipment of this sort from the local firm. To house this equipment the Ford company will have to build 2,500,000 feet of dry kiln buildings, exclusive of storage buildings and transfer ways.

Sales by Stewart-Warner Nearly Double Last Year's

CHICAGO, May 16—The great activity of automobile manufacturers is strikingly reflected at the plant here of of the Stewart-Warner Speedometer Corp., which is working at high speed and increasing its output as rapidly as new employees can be absorbed. Since early in the year the number of employees has been doubled and is now in excess of 2000.

The sales of the company for the first week in May came within a few dollars of being twice as much as the sales for the corresponding week last year. Officials of the company state that the orders now on hand and the increased factory output indicate that the money value of this month's business will be the greatest of any month in the company's history. The previous high month was the May of 1920.

In addition to factory products, the company also has a great demand for replacement products which are sold to branches and dealers. Orders from these sources have come in such volume recently that the company is having great difficulty in filling them. There is an unusual demand for the new Ford speedometer which indicates by colored dials when and where the car should be lubricated. That part of the factory making these speedometers has had to work day and night.

Business Revival Helping Consolidated School Idea

PONTIAC, MICH., May 16—Change in industrial and business conditions generally is expected to have a beneficial effect on the consolidated school situation which holds strong promise for motor bus manufacturers. Michigan a year ago was swept by a school consolidation wave, and many communities in the rural districts considered merging several school districts into one, with a central building and bus lines to bring in the pupils.

Business depression, affecting the farmers and villagers, however, resulted in the defeat of several of the bond issues proposed to put up the consolidated schools, with the result that the movement received a setback. A more favorable attitude toward bonding for such purposes is now being manifested.

Credit Conditions Steadily Improving

Past Due Accounts Decrease—Few Companies Ask Parts Makers to Take Notes

NEW YORK, May 12—Credit conditions in the automotive industry are steadily improving. Parts manufacturers report that they are being asked to accept notes only by a comparatively few companies, which have been in financial difficulties for months and have not obtained additional financing.

Vehicle manufacturers who are producing on a large scale are rapidly wiping out their past due notes, and many of them already have cleared their books. All but a comparatively small percentage of the current business is being paid for when due, and some companies are discounting their bills.

There has been a steady whittling down of past due accounts for the past three months, and continued progress in this direction is being made, except by the companies which have been unable because of lack of working capital, to take advantage of the present extraordinary demand for cars and trucks.

The rapid improvement in collections has made it possible for the parts makers to liquidate a large part of their own indebtedness, and their position in this respect is much stronger than at the beginning of the year. They also are able to pay their bills when due and have ceased in large measure to ask the indulgence of the companies from which they buy their supplies of raw materials.

Gasoline Extracting Process, Basis of Suit

NEW YORK, May 15—Trial of the action of George T. Rogers of Plainfield, N. J., against Joseph H. Adams to establish claim to a 40 per cent interest in the defendant's process for extracting gasoline from crude oil has been started in the Supreme Court here. The process is now controlled by Adams and the Texas Co.

The Standard Oil companies of New Jersey and Indiana are said to be paying royalties for use of the process. The suit is based on an alleged assignment by Adams to Rogers of a 40 per cent interest in the original process patents which the plaintiff contends also gives him the same interest in the improved process which is said to separate 15 per cent more gasoline than the original. Millions of dollars are said to be involved in the suit.

LOUIS E. STROTHMAN DIES

MILWAUKEE, May 16—Louis E. Strothman, vice-president and general manager of the Richardson-Phenix Co., now a division of the S. F. Bowser Co., Fort Wayne, Ind., died here after an illness of six months, at the age of 43 years.

Tire Output Is Now 85 Per Cent of Peak

Production Far Ahead of Normal —Demand Was Generally Underestimated

AKRON, May 15—Akron tire factories are finding it impossible to meet the current demand for tires. Although several thousand seasoned tire builders have been re-employed within the past six months, many companies are finding it necessary to draw upon reserve supplies and upon their finished goods inventories to meet the rush orders being received daily from both dealers and motor car manufacturers.

Plainly the demand for tires has been underestimated not alone by tire manufacturers but by car manufacturers and tire dealers. A policy of ultra-caution in ordering stocks and in getting a quicker turnover of stocks on dealers' shelves has brought the tire industry to the verge of an absolute tire shortage, unless there is a slight let-up in the demand of sufficient duration to permit manufacturers to catch up.

85,000 Casings Daily

Tire production in Akron by an actual survey now exceeds 85,000 casings a day. The same companies reporting this aggregate output show a combined peak production during the abnormal season of early 1920 of slightly over 101,000 tires a day. These figures show that output now is 85 per cent of peak and far ahead of normal tire production, for normal is based at 75 per cent of peak.

Numerous companies are producing above the old 1920 peak marks. This is more particularly true of the smaller companies. The larger companies are operating three eight-hour shifts daily and have exhausted the available supply of experienced tire builders. They have sent out urgent appeals for tire men, seeking to recall former employees who now are employed elsewhere.

How long the current spurt will last no one will venture a prediction, although most manufacturers are confident that it will continue for some time and have given reasonable assurance of steady employment at least until August 1 to the hundreds of men taken on since April 1. There are a few exceptions, however, with some manufacturers feeling that June will bring a seasonal slump in tire sales. These men still advise a policy of caution and warn against too swift a pace which will result in an overproduction.

Goodyear Adding Men

The Goodyear Tire & Rubber Co., as compared to a peak production obtained in 1920 of 31,000 casings a day, now reports a production of 26,000 tires daily and is still putting on men. Goodyear has jumped from about 20,000 tires at the first of April. Firestone is running proportionately closer to its old peak record of 28,500 casings a day with a present output of 25,000 daily. The B. F. Goodrich Co. reports considerable sales improvement through the introduction of new tire lines and is producing about 16,000 daily as compared to a peak of 26,000. The Miller Rubber Co. is straining its plant to the utmost, producing 6500 a day as against a peak of 6000. Miller recently acquired 100,000 square feet of storage space near its factory and will use it for stock supplies, so as to free factory space for installation of new equipment to increase production.

The smaller tire companies all are booming. Mason at Kent, near Akron, is running 3500 casings a day as against a peak of 2500. General of Akron has passed its old peak of 1200 daily and is averaging over 2000 a day. Kelly-Springfield's Akron plant is back to the old top record of 1600 casings. Mohawk is producing 800 and Swinehart 750. Each of these companies had a peak of 1000. India is above its old high watermark of 500 and reports an output now of 700 a day. The American Tire & Rubber has climbed back to its highest production mark of 750 daily.

The Seiberling Rubber Co. is producing over 1200 cords a day at its Barberton plant and over 800 Portage fabric tires at New Castle, Pa.

Price of Cotton May Advance

CHICAGO, May 13—Continuation of good business in the tire industry was reported by members of the Midwest Rubber Manufacturers Association, who attended the association's monthly meeting here. Representatives of tire fabric producers said there is a very heavy demand for their product and that there are indications of an increase in the price of cotton, which would have to be passed on in the price of tires.

Truck Gains Shown in Engine Schedules

(*Continued from page* 1082)

A discussion of centers of the largest automobile buying at the present time shows the industrial cities of the middle west, particularly those between the Alleghanies and the Mississippi, to be leading. The eastern industrial districts have fallen off, especially in the New England states, it is declared, owing to strikes and industrial unrest, from which the middle west has been free.

Factory officials in the sales end of the industry are not concerned over the business probabilities for the remainder of the year. There is little speculating being done over this but on the contrary there is much sound planning under way which it is expected will keep the cars moving into the hands of owners as rapidly as they can be made. One executive of a company whose product is enjoying wide popularity in the present market said there would be no attempt to force the cars into the hands of dealers, but on the contrary, care would be taken to ship them only as fast as they can be readily absorbed. In his estimation the best months will be from February to June and September and October.

Car, Truck, Tractor, All Share in Demand

Power Farm Operating Equipment Industry, Also, Is Experiencing Definite Revival

MILWAUKEE, May 15—With all passenger car factories in this district shipping cars to distributors and dealers as fast as they come through the shops, and unfilled orders, especially for closed types, piling up at a rate that is reminiscent of 1919 conditions, the automotive industry at the middle of May stands in an especially gratifying position. The improvement noted in motor truck demand in the last sixty days is steadily being accentuated as the transportation problem of general business becomes more difficult with the increasing demand for commodities of all kinds. The tractor and power farm operating equipment industry is now experiencing a definite revival, although it still has far to go to get to a satisfactory basis.

In Milwaukee makers of motors, transmissions, universal joints, steering gears and similar units are unable to make deliveries in the volume demanded by shipping directions, which have advanced sharply in the last four to six weeks. Makers of car manufacturers' equipment, such as lamps, switches, coils, grease cups, etc., also have fallen behind on deliveries because production has not been able to keep pace with requirements, despite great effort.

Equipment Makers Gain

Tire manufacturers are making further increases in working forces and enlargement of daily output. Concerns making automotive equipment for the wholesale and jobbing trade as distinguished from manufacturers' stock equipment report a marked increase in sales, due to the improved condition of consumer demand. Producers of fenders or bumpers are especially busy, the demand at this time being of relatively enormous proportions. Discounts on collision insurance rates for bumper equipment have helped bring about this condition.

What is of distinct interest at this time is the substantial confidence held in the immediate future of the industry among men engaged in all of its manifold phases. At first apprehension was expressed that the sharp revival of passenger car sales might be merely a flurry of temporary nature, but analysis of conditions by keen students indicates that the automotive industries have to look forward to a well sustained call for an indefinite period, with activity holding up at or probably above the present rate until October and later.

BEGIN G. M. TRUCK TEST HOUSE

PONTIAC, MICH., May 16—Construction has begun this week on the new test house of the General Motors Truck Co. here, into which will be moved special test house equipment built to order at a cost of approximately $300,000.

Men of the Industry and What They Are Doing

Mock Heads Body Company

Ralph D. Mock, until recently an executive officer of the Hydraulic Steel Co. of Cleveland, has become president of the Colonial Body Co. of Boston. He was one of the organizers and is president of the Cleveland Finance Co. as well as the Metropolitan Securities Co., with which the former is now affiliated.

Since incorporation in 1919 Mock has served as the financial vice-president of the Hydraulic Steel Co. and later was associated with the sales department. He also served as treasurer of its predecessor, the Hydraulic Pressed Steel Co. During this period of nearly 10 years he was in close contact with many executives of the leading automobile and motor truck manufacturers of the country, as well as many bankers in the East and central West. Prior to the war he served as Chairman of the Credit Committee of the Motor and Accessory Manufacturers Association and more recently on the Open Shop Committee of the National Association of Manufacturers, both of New York City.

Willys Spending Week on Farm

John N. Willys is spending a week with his family on his Long Island farm. He is enthusiastic over the outlook for the Willys-Overland Co., but unhappy because the factory is unable to meet the demand for cars. After spending his time for months stimulating the sale of automobiles, Willys now is devoting considerable attention to digging up supplies of essential parts in order to speed up production at the factory.

Elwood Haynes Honored

Elwood Haynes, president of the Haynes Automobile Co., has been awarded the John Scott Medal, certificate and premium "for his discoveries in stainless steel, stellite and chrome-iron," according to an announcement by the faculty of Worcester Polytechnic Institute, from which Haynes was graduated in 1881. The medal and certificate will be presented at the June commencement exercises of the institute. The fund yielding the income from which these awards are made was left to Philadelphia by John Scott of Edinburgh, who provided in this way the honoring of "ingenious men and women who make useful inventions."

Search to Advertise Carter

Major C. W. Search of the Carter Motor Car Co., Inc., of Washington has been placed in charge of the domestic and foreign advertising of the Carter car.

Lord Resigns from Moline Plow

Henry S. Lord, vice-president and treasurer of the Moline Plow Co., has resigned his position after an association with the company covering a period of ten years. He has not announced his plans for the future.

Le Fevre Leaves S. A. E.

C. D. Le Fevre, formerly actively identified with the work of the Society of Automotive Engineers, has resigned to become eastern manager of manufacturers' sales of the Westinghouse Union Battery Co., Swissvale, Pa., with headquarters in New York City.

Clark in Importing Business

W. W. Clark, for a number of years export manager of the Hart-Parr Co., will enter the wholesale importing business with headquarters in Charles City, Iowa, where he will also have a retail sales display room. A large line of goods both in art and utilities from European countries and the Orient will be imported by him.

Monk with U. S. Ball Bearing

Marvin E. Monk has been appointed assistant sales manager in charge of general sales of the U. S. Ball Bearing Manufacturing Co. of Chicago. Monk was formerly special sales engineer for Manning, Maxwell & Moore, Inc., New York City. J. J. Torpey will continue as assistant sales manager in charge of bearing distributors.

Jefferson with Agency

G. C. Jefferson has resigned as assistant advertising manager of Earl Motors, Inc., and has joined the western staff of Grandin-Dorrance-Sullivan, Inc., advertising agents. He will make his headquarters at the new South Bend offices of the agency. Before joining Earl Motors, Jefferson was identified with the Oakland Motor Car Co. and the William N. Albee Co., Detroit.

Kinstler, Van Wheel Sales Manager

Leon L. Kinstler has been appointed sales manager of the Van Wheel Corp. of Syracuse. For several years Kinstler was in charge of inspection and acceptance of the Government's automotive engineering work. He has a wide acquaintance among passenger car and truck manufacturers.

Lorch Goes with U. S. Tractor

George L. Lorch, superintendent of the Eagle Manufacturing Co., Appleton, Wis., manufacturing Eagle tractors and power farm tools, has resigned to accept a similar position with the U. S. Tractor & Machinery Co., Menasha, Wis., manufacturing Uncle Sam tractors and now engaging also in the production of tractor implements and power farm machinery.

Latta Enters Financial Field

L. E. Latta, secretary of Earl Motors, Inc., and a member of the Earl board of directors, has resigned to take charge of the legal department of a large financial corporation. Latta has been connected with the automobile industry since 1906. After four years in the accessory field, he became secretary and business manager of the Maxwell-Briscoe Motor Co. at Tarrytown, N. Y., in 1910. Later he joined the United States Motor Corp. as secretary, taking charge of the legal department in New York.

When the United States Motor Corp. was reorganized as the present Maxwell company, Latta joined Benjamin Briscoe in the organization of the Briscoe Motor Co. and the Argo Motor Co. continuing as secretary after this merger in the Briscoe Motor Corp. and the latter's reorganization as Earl Motors, Inc.

Packard Promotes White

George White, assistant purchasing manager of the Packard Motor Car Co., has been made manager of that department, succeeding F. W. Boynton, who has resigned to join the Anderson Motor Car Co. in an executive capacity.

Shartle Joins Inland Products

R. H. Shartle, for several years master mechanic for the Wagner Electric Co. and previously identified with the Dalton Adding Machine Co., has associated himself with the Inland Products Co., St. Louis, as works manager in charge of factory production.

Burn Changes Companies

Walter P. Burn, formerly assistant sales promotion and advertising manager of the Tide Water Oil Co., New York, has been appointed sales promotion and advertising manager of the Transcontinental Oil Co., Pittsburgh, succeeding E. D. Mason.

John B. Hurst Forms Company

John B. Hurst, who has been connected for more than twelve years with Herbert Brothers, Philadelphia distributor of Chandler and Cleveland cars, has formed the Hurst Co., to handle the sale of the same cars, together with the Lovejoy shock absorber for Berks county, Pa., with headquarters in Reading.

Harrington to Address Convention

Howard Harrington, advertising manager for the Moline Plow Co., will be the only advertising man west of Chicago to speak at the eighteenth annual convention of the Associated Advertising Clubs of the World at the Milwaukee meeting, June 11 to 15. Another speaker will be Edward S. Jordan, president of the Jordan Motor Car Co.

Plants Speeding Up in All Branches of the Industy

Hanson Doubles Production

ATLANTA, May 17—April production of the Hanson Motor Co. of five cars daily is being doubled this month and the company is still behind on orders. While orders are being received from all sections of the country, New England business is declared to be showing an unusual increase. New agencies recently opened include New Orleans, Pittsburgh, Milwaukee, Cincinnati and Knoxville. An agency contract has also been closed with Scott-Young, Ltd., of Australia and orders have been placed by this concern for 20 cars monthly.

Tank Factories Active

FORT WAYNE, IND., May 16—Wayne Tank & Pump Co. reports that it now has 725 employees and is adding to its force. Two shifts are working in the machine shop, putting in 80 working hours a week, and other factory departments are operating at nine and a half hours a day.

S. F. Bowser & Co., Inc., tank and pump manufacturer, is employing 1400 men. S. B. Bechtel, the president, says: "We are working a full force full time on the day side and are working a small night force in the machine shop. Business is picking up, and general conditions are looking very good."

Thousandth Rickenbacker Shipped

DETROIT, May 15—The Rickenbacker Motor Car Co. produced and shipped its one thousandth car, May 10, this total output having been reached in less than three months, and about 60 days after the company got into volume production. The feat was made the occasion of a factory celebration in which all executives participated. The car, after a short triumphant trip, was made part of a shipment to the Kaar Motor Car Co., San Francisco distributor.

Greater Parts Schedules

PONTIAC, MICH., May 15—The Standard Auto Parts Co.'s branch here has been increasing its production schedules, chiefly on spring for Fords and other jobs, to such an extent that some sections of its shop are now working three shifts daily.

Growing Demand for Tires

SPRINGFIELD, OHIO, May 16 — President H. S. Berlin of the Victor Rubber Co., upon his return from a visit to the branches and various cities in the Southwest, stated that he and H. A. Grubb, salesmanager, found conditions very encouraging. "Things are improving in the Central West and the Southwest," he said. "We have just returned from a trip to Chicago and the Southwest, including, Kansas, Texas, Oklahoma, the oil country and the wheat belt. Weather conditions have been trying lately, but now there is an improvement. As a result there is an increasing demand for rubber tires."

Berlin stated that the Victor plant is operating full time five days a week. This schedule will be continued until inventories have been reduced.

EMPLOYMENT STILL GAINING

DETROIT, May 15—A further increase of 3,683 employees, making a new high total of 158,889 on the payrolls of the members of the Employers Association, was reported for the week ending May 13. This is 40,000 above the corresponding week last year, and only 30,000 less than for the corresponding week of 1920.

Franklin Schedule Increased

SYRACUSE, May 15—The Franklin Automobile Co. reports that it has increased its production schedule 43 per cent, the company expecting to operate at the rate of 14,000 cars a year by May 27. May shows every indication of exceeding all former records done by Franklin dealers in that month, 403 deliveries having been registered May 1 as a start.

Tire Company Gets Year's Contract

MARION, OHIO, May 15—The Studebaker-Wulff Rubber Co. has received an order from the Stewart Oil Co., Macon, which distributes through the State of Georgia, calling for 50 casings and 60 inner tubes a day for one year from May 1. The tire company reports that since it started production in March it has received orders faster than it could increase its output.

Peerless Cars by Trainloads

DETROIT, May 17—Peerless cars are leaving the plant by trainloads, says an announcement from the factory. Not less than five freight trains of cars have left the plant during the last few weeks, and plans are now being made for two more trainloads to follow. Each shipment consists of more than 60 automobiles. Orders are being received in increasing numbers from the West.

Haynes and Apperson Gain

KOKOMO, May 16—The plant of the Haynes Automobile Co. is said to be operating near to capacity and working up to a schedule of forty cars a day. The Apperson plant is also feeling the increased spur of the revival and is now said to be at about 75 per cent of capacity.

Maxwell Increases Force

DETROIT, May 16—Maxwell Motor Corp. has added a sufficient force to produce 300 cars a day, the capacity of its plant.

Truck Output Increasing

SPRINGFIELD, OHIO, May 16—Additions were made during the past week to the force at the plant of the Kelly-Springfield Motor Truck Co. Production is steadily increasing to meet the demands of the trade.

Owing to the scarcity of material, the Springfield works of the International Harvester Co. is having difficulty in keeping up its schedule of 50 light motor trucks a day. It is hoped to get up to the schedule this week.

Dudlo Adding to Factory

FORT WAYNE, IND., May 15—Dudlo Manufacturing Co., which produces coils for Ford and a number of other concerns, is rushing a new building to completion to relieve the crowded factory condition. The Peru plant of the company which has just been opened will probably put in winding machines for Ford coils. There are now 1200 men employed at this plant, which is the greatest force in its history. A night force has been installed, and within the month more men will be placed on the force to operate winding machines.

Moon Exports Show Big Gain

ST. LOUIS, May 15—Foreign shipments of Moon cars for April were greater than for any one month since July, 1920. Present indications are that May will show a further increase, E. H. Serrano, director of exports, reporting that the company has enough unfilled orders on hand to exceed April shipments by 100 per cent. While business is well scattered, Mexico offers the best market. At the present time shipments are going forward to Spain, Canada, Sweden, Canary Islands, Australia and Argentina.

Sterling Tire Increasing

RUTHERFORD, N. J., May 13—The Sterling Tire Corp. reports that by the middle of summer it expects to be producing 1500 tires daily. At the present time and since February, it has been turning out 1200 tires a day, which has necessitated 24 hour a day operation. Unless the capacity is increased, the company will be heavily oversold by July. March sales were larger than in any one month in the entire previous 14 years history of the company. The good conditions with the concern are stated to be due to increased production, more efficient management and sweeping cuts in selling overhead.

Motor Wheel Employing 1800

DETROIT, May 16—The Motor Wheel Corp. is now employing 1800 men as compared with 800 sixty days ago, and is working many of its departments three shifts daily. The rim department at the Prudden unit is on a 24-hour basis and the machining department at the automobile wheel unit is on the same schedule.

Pierce-Lafayette Merger Abandoned

Smaller Bank Reported to Have Held Out for Higher Rates

NEW YORK, May 15—Announcement is made by the banking house of J. & W. Seligman & Co. that negotiations for the consolidation of the Pierce-Arrow Motor Car Co. and the Lafayette Motors Co. have been abandoned because of inability to agree upon terms. No further explanation has been given up to this time, although Colonel Charles Clifton, chairman of the board of the Pierce-Arrow company, said in Buffalo that a statement of the reasons would be given out in New York by committees representing both boards of directors.

It is understood that the negotiations failed because one of the smaller banks carrying part of the Pierce-Arrow loans would not come in under the plan tentatively agreed upon by other banks and directors of both companies. Under this plan the consolidated company was to issue approximately $10,000,000 notes or bonds, the proceeds to pay off bank loans of both companies and provide working capital. The dissenting bank held out for a higher interest on the new securities than other interests thought should be paid.

Action a Surprise

Announcement that negotiations were off came as a complete surprise, because it had been understood only a few legal difficulties, based upon the fact that the companies were incorporated in different states, stood in the way of their completion.

Under the consolidation plan, C. W. Nash, president of the Lafayette company and of Nash Motors, was to be in charge of operations as chairman of the board of the consolidated companies, while Colonel Clifton was to serve as president. The only explanation ever offered for the proposal to unite the two companies was that some of the surplus factory space of Pierce-Arrow could be used to build bodies for the Lafayette. It was stated that both cars would be continued as at present.

Pierce-Arrow is operating at a slight profit, with passenger car sales holding up well and truck business better than for the corresponding period last year. There is no pressing merchandising liabilities, but bank loans aggregate $8,000,000. Elimination of these through a note or bond issue has been under consideration and probably will be accomplished upon the first favorable opportunity.

WILL MAKE COATS BODIES

CHICAGO, May 15—The Coats Steam Car Co. announces that the F. Y. Stewart Manufacturing Co. of Bowling Green, Ohio, has acquired the factory of the Buckeye Body Co. at Columbus and will manufacture the bodies for Stewart-Coats steam cars and assemble the cars in that factory. The engines and boilers are being manufactured in the Stewart plant at Bowling Green. The Columbus factory is said to have a capacity of 35 cars a day. The general sales offices of the Coats company will be in Chicago.

"SPEEDIACS," NAME APPLIED IN SPOKANE

SPOKANE, WASH., May 15—Reckless and speedy automobile drivers—violators of the state motor vehicle laws—will be known as "speediacs" in the Spokane public press hereafter as the result of a slogan contest conducted by the Inland Automobile Association, to ascertain a fitting name to be used in branding automobile drivers who disregard the safety of fellow motorists and pedestrians.

For the best name offered, Frank W. Guilbert, secretary of the association, gave a prize of $10 cash. Three superior court judges, associated with speeders in the public courts, were named to select the winning name, as well as nine other best names.

"Speediac," the winner, with the nine other names, was sent to the American Automobile Association headquarters, Washington, to compete for national honors and a prize of $25.

Robbins & Myers Makes Financing Arrangements

SPRINGFIELD, OHIO, May 16—The Robbins & Myers Co., manufacturer of motors and fans, has completed arrangements for the underwriting of $3,000,000 bonds and $1,500,000 new stock, thus carrying out its refinancing plan.

F. S. Hunting of Fort Wayne, Ind., for 34 years with the General Electric Co., has been chosen president of Robbins & Myers, succeeding C. F. McGilvray, who has been in ill health for the past year. Hunting will also serve as general manager of the company. Wilbur J. Myers continues as vice-president, Warren A. Myers as secretary and H. E. Freeman as treasurer.

The company is now employing 1000 men and women. Its normal force is 2800 to 3200.

JORGENSON TO CONTINUE

MILWAUKEE, May 15—At the first meeting of creditors on May 11 of the Jorgenson Manufacturing Co., Waupaca, Wis., a voluntary bankrupt, opinions were expressed that the organization will be rehabilitated and the manufacture of Jorgenson primers and other automotive equipment resumed with but little delay. Lack of working capital caused the officers and stockholders to petition for a trusteeship to facilitate reorganization. Assets scheduled are $120,215, compared with liabilities of only $44,802.

Plant Service Heads Endorse Flat Rates

Change of Sentiment Evident at Convention—Small Number Against System

DETROIT, May 16—Flat rates turned out to be the big subject the first day of the factory service managers' convention being held at the Hotel Statler. Sentiment has undergone a great change in the last few conventions, and practically all managers are now in favor of the system in one form or another, but there was considerable discussion as to just the best way. Some prefer a flat rate on both time and material, but the majority prefer a flat rate on time only.

There is a small minority still prejudiced against the system with a rather surprising lack of knowledge displayed as to the extent of its application. Many dealers and distributors are far in advance of the factories in working out and applying flat rates.

Edward S. Jordan, president of the Jordan Motor Car Co., opened the session with a talk on fundamental thinking in the industry. He said it was possible to make money in the automobile business by advertising enough and promising enough, but that the business would not stick without service and if too much were promised the service department would not be able to make good and the product would fall down.

He made a strong appeal for a single purpose and a single model, and said that producing 20 models in one plant brought all the service problems of 20 service departments in 20 plants.

"Pirate" Parts Discussed

Other topics taken up were pirate parts and the difference between them and substitute parts. It was conceded that the problem of the substitution part is a competitive one and can be met only by right prices, quality goods and extensive distribution. A communication from the Body Builders Association, asking for co-operation in formulating suggestions for the June convention was referred to a committee headed by S. T. Norton.

H. H. Rice, president of the Cadillac Motor Car Co., related some early experiences in the industry and spoke highly of the service work done in the past few years.

Don Hastings, Hupmobile distributor in Detroit, presented a comprehensive picture of the retailers' problems and told how necessary it was for the retail organization to be prepared to service the vehicle correctly. In his opinion the retail service station is the feeder for the sales department, and fully half the prospects are secured through satisfied customers. The subject of dealer education was handled by R. A. Shelly of the Dort Motor Car Co., and Harry Moock of the Hudson Motor Car Co. told of the great need of the small town dealer for information and real assistance in his service problems.

Hudson-Essex Fixes Ratio of Exports

Heavy Increases in Demand Abroad Have Made Settled Percentages Necessary

DETROIT, May 17—Heavy increases in the Hudson-Essex export business have caused the company to establish a fixed percentage of the total output of the two lines for its export business and orders are now being taken subject to delivery as the export proportion of its product permits. In fixing the export ratio, factory officials declare that the company has taken into consideration the plight of the export agents in the past eighteen months and has favored them slightly over the domestic distributing organization.

European business, hitherto slow, is picking up briskly, and orders are booked up for some time to come. England for the first time is reported ordering closed cars in surprising volume. Shipments have been resumed to the northern European countries, including Denmark, Norway and Sweden. Canadian business is reported becoming especially good.

The receipt of a letter recently from a dealer in Java is reported by the company, in which the dealer said business prospects were very poor and that he did not know when an order for a volume shipment might be placed. The day the letter arrived a cable was received from the same dealer ordering $50,000 worth of Hudson and Essex cars for immediate shipment.

South American business, especially in the Argentine, is reported increasing rapidly. South African business continued steady despite the recent labor disturbances and showed slight increases. Good business is reported from Australia in which the closed car demand features in increasing quantity. Shipments are now being made to fifty companies, and to date these exceed 1921 shipments by 250 per cent.

G. M. President Reports Good Export Conditions

NEW YORK, May 16—Good conditions in export business were reported by Pierre S. duPont, president of General Motors Corp., upon his return from an inspection trip of the plants of General Motors of Canada, Ltd., at Oshawa and Walkerville, Ont., taken in company with other officials of the corporations.

In speaking of conditions, duPont said:

The corporation is developing in its Canadian plants a line of export models which meet the requirements of foreign countries in the matter of taxation, fuel consumption, weight, tire mileage and economical upkeep, which are major considerations in influencing the purchasing of American products in foreign countries.

The export business of the corporation is running three times what it was forecast six months ago. Recently a solid trainload of automobiles left for St. John, N. B., whence they will be shipped to General Motors, Ltd., our English subsidiary, for distribution in Great Britain. In this one shipment there were 315 passenger cars. The value was $320,000 and transportation charges were $40,000.

The foreign demand for all General Motors cars is strong, especially Buick and Chevrolet. In the three and a half months from Jan. 1 to the middle of April the total shipments of all General Motors cars from the factories of General Motors of Canada were 10,126, compared with 4,102 cars in the corresponding period of 1921.

N. A. C. C. COMPILES FIGURES OF INDUSTRY WHICH COVER YEAR 1921

NEW YORK, May 16.—Automobile statistics for the year 1921 as prepared by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, show the registration in the United States of about 10,448,632 cars and trucks, a gain of 13 per cent over 1920. Production of cars and trucks for the year is given as 1,668,550, of which 154,550 are trucks. The combined wholesale value of these was $1,260,000,000. The figures are shown in the following table:

PRODUCTION IN 1921	
Cars and trucks produced	1,668,550
Passenger cars produced	1,514,000
Motor trucks produced	154,550
Wholesale value of cars and trucks produced	$1,260,000,000
Wholesale value of passenger cars produced	$1,093,918,000
Wholesale value of motor trucks produced	$166,082,000
Wholesale value of parts and accessories output	$409,710,000
Value of tire replacements	$542,358,420
MOTOR VEHICLE MANUFACTURING BUSINESS	
Capital invested	$1,423,500,000
Cost of material bought	$1,057,230,000
Number of employees	186,000
Wages and salaries	$299,098,780
TIRE AND FUEL FIGURES	
Gasoline produced, gallons	5,153,549,318
Gasoline consumed, gallons	4,516,012,979
Tire casings produced	27,275,000
MOTOR VEHICLES USED ON FARMS	
Cars and trucks on farms (approx.)	3,000,000
Automobiles on farms (approx.)	2,850,000
Motor trucks on farms (approx.)	150,000

Marmon Has Unfilled Orders Exceeding 500

INDIANAPOLIS, May 16—Manufacturers here are experiencing the phenomenal increase in business that has been general the last two months. Marmon has over 500 unfilled orders, or approximately one months' delivery. The factory is producing 20 cars a day and may reach capacity of 25 daily before the end of the month. The recent price reduction had a very stimulating effect and an unexpectedly heavy increase for wood wheels is following the newer prices.

The Midwest Engine Corp. is producing at the rate of 500 engines per month, and releases on engine shipments to tractor companies are coming in, some of these being the first for many months.

F. A. BURGESS DIES

CHICAGO, ILL., May 16—F. A. Burgess, president of the Burgess-Norton Manufacturing Co., Geneva, Ill., manufacturer of B-R piston pins, died suddenly from heart disease, May 14.

Associated Industries Approaches Launching

CHICAGO, May 15—An announcement is expected to be made this week of the formal launching of the Associated Motor Industries—but under another name that it is felt will be more distinctive and have greater selling power. The consolidation will probably include ten of the strongest automotive companies that have been considered, but what they will be will depend upon the attitude of the banking interests that have carried on the investigations.

The consolidated organization plans to operate factories making completed cars and all parts except tires in various parts of the United States, probably in nine different states, with general offices, which will exert centralized control over all activities, in Dayton, Ohio. Dealer and purchaser financing will be arranged.

Associated Motor Industries was incorporated nine months ago in Delaware with a capitalization of $80,000,000.

NEW BODIES FOR HAYNES "75"

KOKOMO, IND., May 16—The Haynes Automobile Co. is fitting its model "75" chassis with two bodies which are new to the chassis, these being the 5-passenger brougham and the 2-passenger "Blue Ribbon" speedster. These body types were previously fitted to the model "47" chassis. The driver's seat in the brougham is upholstered in leather, and the side tire carriers are mounted at the front end of the three-quarter length runningboard on each side.

Brands Registration Bill as Monstrosity

Former A. A. A. President Denounces U. S. Measure Calling It Impracticable

WASHINGTON, May 13—Characterizing as a "monstrosity" the Mills bill providing for a $2 registration tax on all automobiles, Dr. H. M. Rowe, former president of the American Automobile Association, denounced the measure before the Ways and Means Committee of the House, and declared it was impracticable. Much additional opposition to the proposed legislation was also voiced by other witnesses at the first hearing before the committee. Melvin P. Bender, attorney for the New York Automobile Federation, declared that the measure, if enacted into law, would cost American motorists an average of $22 in time and money.

If the bill is passed, it was charged at the hearing, automobile manufacturers will be charged with the duty of stamping on each body and each engine a serial number. For this, it was contended, there must be a charge and consequently an increase in price. In the changing from winter to summer bodies, the owner of an automobile, under the provisions of the bill, must get a special title for the new body not stamped.

American motorists at the present time are paying $344,000,000 Federal and state taxes, the figures presented showed. Under the Mills bill it is expected that the $2 tax will bring in $26,000,000 a year and will mean the creation of thousands of new Federal jobs, in the opinion of Dr. Rowe.

Hiram Todd, U. S. District Attorney for the Northern District of New York, appeared in favor of the bill, contending it would prevent the theft of cars, would reduce insurance and states that the bill had the approval of the Treasury and Justice departments.

Salt Lake City Reports Best Week for Past Year

SALT LAKE CITY, May 13—According to Carl L. Snow, secretary of the Inter-Mountain Automotive Trades Association, more cars were sold last week in this city than in any other single week for the past year. Many dealers have sold out all their stocks and make deliveries direct from the cars. Snow says one reason for the rush is that spring was a month late this year and many buyers held up their orders until the weather was good.

The industrial situation in this territory is better now than it has been for the past eighteen months or two years. The metal mines are open again.

CHANGES AT MITCHELL BRANCH

NEW YORK, May 16—A. G. McMillan, general sales manager of the New York Mitchell Motor Co., has been transferred to the factory at Racine, where he will supervise the working out on a national scale of the plan of sales organization adopted by the New York company. Paul C. Lott, sales promotion manager, has also been transferred to the parent company, his position in New York being occupied by N. R. Cooper. T. L. Coleman has been appointed vice-president and general manager of the New York company as successor to N. W. Dingwall, resigned.

Reo Lengthens Day and Shortens Week

DETROIT, May 18—Reo Motor Car Co. has adopted temporarily a five-day work week made up of five 10-hour days instead of the former five-and-a-half-day week which, after two weeks operation, is declared to be working satisfactorily and giving the company a better production week than formerly. Fifty hours each week are put in by workmen as before without the breakover into the half-day at the week end.

Officials said the schedule, while adopted primarily for the summer so that workmen would have more time for gardens and for week-end vacation trips, might be extended over the full year as a more economic method of factory operation. Divided interest among the men on the short day made it difficult to keep up the high production of the rest of the week. In five 10-hour days, production is found to run considerably higher. The company is operating on a schedule of about 130 motor vehicles daily, divided almost equally between speed wagons and passenger cars.

New York Registrations So Far Aggregate 20,081

NEW YORK, May 15—Registration of new cars in ten counties in and around New York aggregated 21,081 for the first four months in 1922, as compared to 11,510 for the same period last month. April showed a good gain over the preceding month, both in the high and lower priced classes.

Of the cars priced at $2,500 or less, 14 have registered more than 200 since the first of the year, 3 have gone over the 2000 mark and 1 has nearly approached that figure. The remaining go from 228 to 579. In the higher priced class 9 cars have registered more than 40 for the first four months.

A summary of registrations for the ten counties, taken from the monthly report of Sherlock & Arnold, publishers of the Automobile Sales Analysis, is as follows:

Cars Below $2,500	1922	1921
January	2,018	483
February	2,231	1,409
March	6,354	3,396
April	8,407	4,810
Total	19,010	10,098

Cars $2,500 and above	1922	1921
January	283	145
February	273	210
March	632	487
April	883	570
Total	2,071	1,412

Federal Department Is Filming Industry

Work Starts at Studebaker Factory—Pictures for Foreign Distribution

WASHINGTON, May 16—Advertising of the American automotive industry by moving pictures will be one of the biggest steps in the progress of the industry, and the long realized "dream" will be a reality in less than a month, according to the Department of Commerce. Actual work of filming the industry, the department announces, has already begun, under the immediate supervision of Morton F. Leopold, engineer in charge of motion picture activities of the Bureau of Foreign and Domestic Commerce.

The film, which will be called "The Story of an Automobile," is being made at the plant of the Studebaker Corp., at South Bend. When it is completed, it will be brought here and reviewed by a board composed of government engineers and other representatives of the Department of Commerce, who will pass upon it before giving it the government's official endorsement.

Government to Handle Films

Distribution of the film will be entirely under government supervision. Fifty copies will be released simultaneously for showing in South America, Australia and Africa, these being considered by the government as being the most potential fields for automotive export business. Arrangements have been made to show it in Rio de Janeiro during the World's Fair to open there this fall.

Hundreds of scenes are being taken both inside and outside the factory. An airplane was brought from Chicago to film exterior scenes, in order to give a bird's eye view of the magnitude of a modern American automobile plant. At all times a government check will be made on titles and quotations.

BLACK IS A. E. A. CHAIRMAN

BALTIMORE, May 16—S. D. Black, president of the Black & Decker Manufacturing Co., has been appointed chairman of the foreign trade committee of the Automotive Equipment Association. Through his efforts, Gordon Lee, chief of the automotive division of the Department of Commerce, will address the convention of the association at Colorado Springs in June as the representative of Secretary Herbert Hoover.

S. A. E. MEETING IN NEW YORK

NEW YORK, May 17—The metropolitan section of the Society of Automotive Engineers will meet at the Automobile Club, May 25, at 8 p. m., to discuss rail cars. Introductory remarks will be made by Roy H. Wright of *Railway Age*, and a paper will be presented by W. L. Bean of the New York, New Haven & Hartford Railroad, who recently had charge of the trip to New Haven.

Many Firms Occupy Big G. M. Building

Companies With Offices Outside City Locate Detroit Headquarters in Structure

DETROIT, May 13—Space in the General Motors building which has been set aside for Detroit headquarters of companies prominent in the automotive industry whose principal offices are located outside of Detroit is rapidly being taken over. It was the plan of the corporation to set aside the first two floors in the east wing of the building, but this has been extended so that more space might be available.

A list of the companies now maintaining their Detroit headquarters there follows:

American Brass Co., American Enameled Magnet Wire Co., American Wood Working Machine Co., Anchor Webbing Co., R. W. Angstam, Atlas Lumber Co., Auburn Button Works, Bound Brook Oil-Less Bearing Co., John W. Brown Manufacturing Co., John W. Brown Lamp Co., Bryant Engineering Co., Buffalo Bolt Co., Builders Iron Foundry, Carbonater Sales Co., Garrick Engineering Co., Casko Fabrics Corp., Clapp Manufacturing Co., Collyer Insulated Wire Co., Charles F. Craig, Cutter Electric & Manufacturing Co.

Doehler Die Casting Co., Dryden Rubber Co., Dunbar Bros. Co., Duratex Co., Electric Dynamic Co., Endicott Forge & Manufacturing Co., Felters Co., T. P. C. Forbes, Fowler Batting & Fibre Co., Garlock Packing Co., G. & W. Specialty Co., General Devices & Fitting Co., Gibb Instrument Co., C. T. Goodwill, J. C. Haartz, Inc., Hadley Bros.-Uhl Co., Haynes Stellite Co., Hill Pump Valve Co., Hinkley-Meyers Systems Co., Instrument Supply Co., Nathan H. Jewett, Joyce-Koebel Co.

Kent-Moore Organization, Keystone Battery Co., E. G. Krentler, J. J. Lamb & Co., Lasalle Steel Co., Liggett Spring & Axle Co., Linde Air Products Co., Liptak Fire Brick Arch Co., MacBeth-Evans Glass Co., Maring Wire Co., Markomi Co., Inc., Mica Insulator Co., Moloney Electric Co., Mono Corp. of America, Walter G. Morley, Motor Industries Corp., National Seal Co., National Spring & Wire Co., Nugent Sand Co., Ohio Electric & Controller Co., Otis Steel Co., Pittsburgh Steel Products Co., Portland Monson Co., Prest-O-Lite Co.

Republic Flow Meter Co., Henry Richardson, H. G. Seal Co., Schweitzer & Conrad, Inc., Seneca Iron & Steel Co., J. Spaulding & Sons Co., Stackpole Carbon Co., H. A. Strickland, United Conveyor Co., Washburn Wire Co., Whaling & Hartman, Wickwire Spencer Steel Co., C. E. Wise, Youngstown Sheet & Tube Co., N. C. Leidgen, Penco Corp.

STRATTON WITH VACUUMETER

CLEVELAND, OHIO, May 18—F. S. Stratton has resigned as general sales manager of the Grant Motor Car Co. and has accepted a similar position with the Vacuumeter Manufacturing Co., this city.

NEW TIRE VALVE EXHIBITED

CHICAGO, May 12—Representatives of the All-Metal Valve Co. of Detroit exhibited the Holt all-metal tire valve to members of the Midwest Rubber Manufacturers Association at the association's meeting here. It was claimed that the patented construction of the valve, in in which there are neither springs nor washers, makes it absolutely non-leakable.

Production for April Now Placed at 216,000

NEW YORK, May 16—While final figures on April production have not been compiled, additional carload shipments reported to the National Automobile Chamber of Commerce since the first estimate of 213,000 was made now bring the total output of cars and trucks for the month to 216,000. This figure is 4000 below the record established in March, 1920, which was the largest month in the industry, but far in excess of August, 1921, which was the biggest month that year with a production of 180,781.

Predicts Early Adoption of Rural Roads Program

WASHINGTON, May 16—Early passage of the Federal Government's bill embodying the rural post roads program, funds for which were provided in a bill by the House on May 1, has been predicted by the Senate Post Office and Post Roads Committee.

The funds for the good roads program in the Senate are tied up in this committee at the present time in the form of an amendment to the Post Office Appropriation bill.

Price Cuts on Westcott Range from $200 to $600

SPRINGFIELD, OHIO, May 15—The Westcott Motor Car Co. announces price reductions ranging from $200 to $600. The list follows:

	Old Price	New Price
A-44 Standard Phaeton	$1,890	$1,690
A-44 Special Phaeton	2,190	1,890
A-44 Special Sedan	2,890	2,690
C-48 Phaeton	2,090	1,890
C-48 Sedan	3,490	2,890
C-48 Limousine—Sedan	3,690	3,090

HYDRO TIRES REDUCED

POTTSTOWN, PA., May 15—The Hydro United Tire Co. announces a price reduction of 20 per cent on all Ford sizes and 10 per cent on all other sizes.

TWIN CITY TRACTOR LOWER

MINNEAPOLIS, May 15—The Minneapolis Steel & Machinery Co. has reduced the price of its 20-35 Twin City tractor from $2,950 to $2,750.

CORRECTION

Prices of the 3 and 4 passenger models of the Paige car continue at $2,495 and $2,245, respectively, no revisions having been made as was stated in the May 4 issue of AUTOMOTIVE INDUSTRIES.

New Gasoline Prices Rouse U. S. Senator

Congressional Investigation Demanded—Production of Refineries Show Increase

WASHINGTON, May 15—A Congressional investigation into the price of gasoline has been demanded by Senator McKellar of Tennessee in a resolution introduced in the Senate. McKellar asked that a probe be conducted immediately to explain why the price of gasoline has been increased throughout the country, despite the decreased cost of crude oil, and hinted that there has been an agreement between various companies to make price increases simultaneously.

Production Increased.

Simultaneous with the introduction of the McKellar resolution, the Bureau of Mines announced that the production of refineries shows an increase in March of 3 per cent over the month of February.

Data gathered by the Federal Government show that the present stocks of gasoline amount to 854,232,000 gallons, which is 20 per cent greater than for April 1 last year and 36 per cent greater than for April 1, 1920. Domestic consumption of gasoline shows an increase of 7 per cent over the first quarter of 1921 and 25 per cent over the first quarter of 1920. Exports and shipments are the only figures for the past three months that do not show material increases over those of previous years.

The daily average output of gasoline for March amounted to 15,234,770 gallons, as compared with a daily average of 13,541,787 for the same month last year. The total production of gasoline during March amounted to 472,277,870 gallons. The daily average production of lubricating oil during March, 1922, amounted to 2,367,460 gallons, as compared with 2,354,945 gallons for the same month last year. The present reserve of lubricating oil is 236,886,000 gallons.

Louisiana Takes Action

NEW ORLEANS, May 15—Sweeping investigations are being made here as a result of the rise of from 23½ cents to 27½ cents per gallon for gasoline in four days. State Attorney General Coco has already begun an inquiry as to the sudden jump in prices, which were made simultaneously by all the oil companies operating in the city. In behalf of the state, it is stated that an investigation is about to be started by the American Automobile Association and the Motor League of Louisiana, and it is expected that the Department of Justice of the United States will shortly launch an investigation.

NEW D. T. & I. MANAGER

INDIANAPOLIS, May 15—Fred L. Rockelman, general manager of the Ford Indianapolis branch, has been made manager of the Detroit, Toledo & Irontown Railroad, taking office immediately.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

Continued ease was manifest in the local money market last week, with call loans covering a range during the week of 3½ per cent to 4½ per cent, as compared with 3½ per cent to 5 per cent in the previous week. On May 12 the renewal rate was 3¾ per cent, the lowest since April 30. The market was reported dull and inactive for fixed date maturities. Few, if any, large loans were made, and although funds were in fair supply, the inquiry was light. All maturities from sixty days to six months were quoted nominally at 4¼ per cent. The prime commercial rate was 4¼ per cent as in the previous week.

On May 10 demand sterling went to $4.45, marking another new high record in the current upward movement and the highest point reached in nearly three years. This advance was not sustained, however, and subsequent quotations sagged.

Unfilled orders on the books of the United States Steel Corp., as reported for April 30, totaled 5,096,917 tons, the largest amount since June 30, 1921, and an increase of 602,769 tons as compared with the end of March. This increase in unfilled tonnage, together with heavy shipments during the month, estimated at approximately 1,000,000 tons, indicates that new business received in April was approximately 1,600,000 tons, the largest amount reported in any month for nearly two years.

The steel ingot production in the United States in April is reported to be 2,439,246 tons, an increase of 68,495 tons in excess of the March output and more than double the output for April 1921. Production in April, 1922, was at the annual rate of 34,746,000 tons, or an equivalent of 66.2 per cent of the country's capacity. In March the annual rate of production was 33,787,400, or 64.3 per cent of capacity; in February it was 24,889,600, or 47.2 per cent.

After its recent advances, our foreign trade showed a decrease in April. Exports for the month totaled $321,000,000, compared with $330,000,000 in March, and imports amounted to $217,000,000 against $256,000,000 in the previous month. Exports during April were the lowest for any month of the current fiscal year, and about $19,000,000 less than for April, 1921. Imports were the lowest since February and approximately $37,000,000 less than for the corresponding month last year.

For the ten months ended with April, exports aggregated $3,131,000,000 against $5,850,000,000 during the corresponding ten months of 1921. Imports for the period were $2.095,000,000, as compared with $3,264.000,000 during the ten months ended April, 1921.

BLOEMFONTEIN DEALER HERE

NEW YORK, May 16—J. S. Short, manager of Lambon & Co., Ltd., Bloemfontein, Orange Free State, reports, on the occasion of a visit to this country with his wife, that conditions in South Africa are greatly improved, with every indication that the diamond mines will soon reopen. He states that despite the fact that British cars are favored by preferential tariffs and have the additional advantage of an adverse exchange rate, American cars practically have a monopoly of the situation for the reason that British cars are still too high priced.

Hudson Land at Pontiac Not for Airship Building

PONTIAC, MICH., May 16—Denial has been made by Vice-President Howard Coffin of reports that the Hudson Motor Car Co. proposes to utilize for aircraft manufacture the large holdings of land in the vicinity of this city which were purchased by him and President Roy D. Chapin.

Under the name of the Calumet Development Co., Chapin and Coffin bought the 200 acres comprising the holdings two years ago, and since then have been doing development work there in the way of improved roads. Coffin is actively interested in the project for a belt line railway to be put around three sides of the city by the Grand Trunk Railroad, right-of-way for which has nearly all been secured. Construction work is expected to start this summer. No definite statement as to the use to be made of its holdings has been made at any time by the development company, but the Michigan Air Line tracks and the new belt line are expected to make it available for factory sites.

Manila Company Formed to Promote New Engine

LOS ANGELES, May 15—Advices from Manila, Philippine Islands, tell of the formation of a company to promote the manufacture of a new type of two-cycle engine, applying the so-called Junker principle, which has been invented by C. J. H. Penning, resident engineer for the Honolulu Iron Works.

In the new Penning engine the explosion takes place between two pistons which are working in a cylinder open at both ends. The exhaust gases escape through a port in the cylinder wall, which is uncovered by one piston at the end of its stroke, and immediately afterward the other piston uncovers another port which admits a fresh charge into a cylinder. The result is said to be complete scavenging of the exhaust gases from the cylinder.

DODGE BROTHERS, LTD., FORMED

DETROIT, May 15—Instead of requiring its dealers in Great Britain to finance car shipments from Detroit personally, Dodge Brothers has organized Dodge Brothers, Ltd., which will handle sales as an intermediary between company and its British dealers. Similar companies may later be established elsewhere.

FINANCIAL NOTES

U. S. Tractor & Machinery Co. at Menasha, Wis., is marketing an issue of $250,000 7 per cent gold bonds, secured by a first mortgage, the trust deed running to the First Trust Co. of Appleton, Wis. Work will begin at once on the construction and equipment of a new foundry, and several extensions of the machine shops and assembling floor. J. M. Robinson, formerly of the International Harvester Co., is now president and general manager of the Menasha corporation. The bond issue is to enable the company to carry out its plan of enlarging its tractor manufacturing business to embrace tractor implements and power-driven farm machinery.

Republic Rubber Corp. receiver, C. H. Booth, says: "The proceeds from the sale of certificates of indebtedness have been used entirely for the purpose of carrying larger accounts receivable and larger inventories commensurate with the increasing volume of sales. Overhead expenses are still at a minimum, but an equitable adjustment of salaries will have to commence at an early date thus somewhat increasing expenses." The company is behind orders to the extent of 60,000 tubes and sales of casings are exceeding production at its Youngstown plant. The Canton property is turning out 1800 casings daily.

Daniels Motor Co.'s 8 per cent cumulative preferred stock to the number of 10,000 shares is being offered through Gillespie, Meeds & Co. The stock has a par value of $100 and yields 8.42 per cent. With each share of this stock there will be given a warrant for two shares of common stock of no par value upon payment of $10 a share. The purpose of the new issue is to provide funds to pay off all bank loans and increase the company's working capital to care for the increased business now being received.

Stewart-Warner Speedometer Corp. for the quarter ended March 31 reports a surplus of $95,451 after providing $64,867 for Federal taxes and $356,100 for dividends. Profit and loss surplus totaled $7,871,803. Current assets were $6,810,207, against current liabilities of $462,843. Cash was $590,793; accounts and notes receivable $1,717,602, and accounts and vouchers payable $307,402.

Autocar Co.'s first mortgage sinking fund 7 per cent convertible bonds to the amount of $2,500,000 are being offered through Janney & Co. and Redmond & Co., New York. They are due May 1, 1937 at 100 and interest. Bonds are convertible into 8 per cent cumulative preferred stock par for par.

Packard Motor Car Co. has retired $1,000,000 of its 10-year notes, reducing the amount outstanding as of May 10 to $8,250,000. In addition, the company has increased its investments in United States bonds $1,700,000. On May 10 the cash on hand totaled $5,107,000 compared with $3,890,000 Feb. 28.

Vig-Tor Axle Co., Cleveland, manufacturer of internal gear drive axles for motor trucks, is marketing 5000 shares of 8 per cent cumulative preferred stock of a par value of $100. The company offers this stock, subject to prior sale, with a bonus of common to yield more than 8 per cent.

Sterling-Knight Motor Co., Cleveland, is offering through the Cleveland Trust Co. $600,000 8 per cent first mortgage ten-year gold bonds and 20,000 shares of no par value common stock at $10 a share.

J. I. Case Threshing Machine Co. has declared the regular quarterly dividend of 1¾ per cent on the preferred stock payable July 1 to stock of record June 12.

INDUSTRIAL NOTES

Amco Co., Indianapolis, which bought the assets, plant, manufacturing and sales rights of the American Metals Corp. that went into the hands of a receiver in February, has completed its incorporation with William B. Paul president and Guy Lemmon secretary and treasurer. For the present the company is limiting the scope of its production, but expects to broaden its activities to take in the automotive accessories and equipment specialties originally produced by the American Metals Corp. Distribution will be through a limited number of large automotive equipment jobbers.

Six Wheel Truck Co. of Fox Lake, Wis., which recently arranged with Waupun capital to assist it in relocating, has purchased a site at Waupun, Wis., and work is already under way on the first unit of its new plant there. Construction is expected to be completed by June 15. The company manufactures a heavy-duty motor truck designed by F. N. Pettigrew of Fox Lake, who is president and chief engineer. The design has been in limited production for two years at Fox Lake.

Motor Parts Corp., Forestville, Conn., has been closed as a result of the vote of directors to terminate the business. The directors are acting as trustees with William L. Cafferty as their agent. Sept. 30 has been set as the time limit for filing claims and in the meantime an inventory of all assets and liabilities will be taken. There is considered to be every probability that the company will pay claims in full. The corporation was seriously affected by the past business depression.

Jack Tire & Rubber Co., owning the former plant at the Washington Tire & Rubber Co., Spokane, has started operations under the direction of T. G. Richards, president and manager. The daily production of the plant at this time is estimated at 70 tires and inner tubes. The plant has a capacity of 500 tires and tubes daily. Richards is assisted by W. E. Grier, plant superintendent, who was formerly general manager of the Boston Woven Hose & Rubber Co.

Batavia Rubber Co., manufacturer of the Batavia tire, has been placed in the hands of former Supreme Court Justice John Woodward of New York as receiver. This is the second time a receiver has been appointed, the last time the creditors being paid off in full with interest. It is stated that the receiver has power to either sell the plant or to continue to operate it, the probability being that operations will continue.

Duncan Truck Body Works has completed the erection of a modern brick factory in New Orleans. The company plans shortly to begin distribution throughout Louisiana, Mississippi and Arkansas, according to James H. Duncan, president. Sales are made direct to truck users as well as to dealers.

Capitol Motors Corp.'s building at Tiverton, Mass., has been sold to J. Edward Newton of Fall River, treasurer of the Barnard Manufacturing Co. The corporation formerly was engaged in manufacturing Capitol trucks but recently went into bankruptcy. The sale does not include the machinery.

Durant Motor Corp. has obtained a permit from the Oakland, Cal., building department for the construction of an office and administration building in that city to cost $100,000. The building will be of reinforced concrete, all-daylight construction and of one story.

Dixie Belle Refining Co. has been reorganized as the Louisville Refining Co. and will begin immediately the erection of a plant in Louisville. The company has a capital stock of $650,000 and the plant will have a capacity of 2000 barrels daily.

Miller Rubber Co. has leased a portion of the Standard Oil Cloth Co.'s plant near the Miller factory for storage purpose. This will release additional manufacturing facilities in the Miller plant, which has been operating close to capacity.

Columbus Auto Brass Co., Columbus, will soon complete the erection of a new building adjoining its plant for use as a repair department. This department now is being maintained a half mile away from the factory. New machinery will be installed.

American-La France Fire Engine Co., Inc. and its subsidiary, S. F. Hayward & Co., have moved their New York offices to the Fisk Building in Fifty-seventh street between Broadway and Seventh avenue.

U. S. Indestructible Gasket Co., New York, announces the consolidation of its executive, manufacturing and warehouse departments and its removal to 829 East Fifteenth Street, Brooklyn.

Eastern Parts Manufacturing Co., New York City, has been placed in the hands of Louis S. Posner as receiver. The liabilities are estimated at $150,000 and the assets, $25,000.

Garnishee Proceedings Approaching Decision

DETROIT, May 16—Testimony in the garnishee proceedings instituted by General Motors Corp. against two Lansing, Mich., banks to recover $490,000 paid Edward Ver Linden, as president of the Olds Motor Works, has been heard before William S. Sayers, master in chancery, and referred to Judge Tuttle for final disposition.

Bank witnesses testified that the money was issued to Ver Linden on a company's check drawn by himself and countersigned by another officer of the corporation, on which it was written that the money was an advance pending the adjudication of disputed claims. At Ver Linden's request, it was testified, the bank issued two cashier's checks for $170,000.

General Motors garnisheed the two banks in which the checks were deposited and their face value drawn, contending that the banks should have retained possession of the proceeds and not allowed the money to be withdrawn until the validity of the transaction was established.

WILSON WITH MOTOR WHEEL

LANSING, May 15—W. H. Wilson has been appointed works manager of the Prudden plant of the Motor Wheel Corp. Wilson has been identified with the automotive industry since he helped to build the first three cars turned out by Oldsmobile. He later became chief inspector at Olds, and subsequently was with the Cadillac and Leland organizations. Following the war he returned to Cadillac and then went to the Elizabeth plant of the Willys Corp. He left Willys to join Motor Wheel.

METAL MARKETS

Within the next few days sheet prices for third quarter delivery are expected to take on more definite shape. Some automotive orders for mid-summer shipment are said to have been placed with the price left open. In fact, sheet interests once more sing the praises of automotive consumers which class of buyers, they aver, is far more concerned about service and deliveries than about price. The independents predict that the chief interest will in the near future advance its sheet prices, the wish, of course, being father to the prophecy.

Non-integrated sheet producers are in a dilemma because of the tight conditions in the sheet bar market where $35 is seemingly the inside price for the relatively scant tonnage for which makers of this semi-finished description are willing to commit themselves. Surface indications, look where you will, tend to encourage the bullish frame of mind in which the steel industry finds itself these days. Building and railroad demand is expected to be active during the third quarter. With the return of the jug-handled accordion contracts, however, the danger of producers overselling and of consumers overbuying looms up. Sooner or later there must come a day of reckoning and, in spite of all theorizing regarding the sanctity of contracts, a readjustment of values to lower levels following top-heaviness is invariably attended by wholesale cancellations or evasion of contracts.

So far the volume of this sort of contracts which in a declining market invariably turn out to be nothing more than "scraps of paper" is very light but it is well to look the problem in the face before it becomes again so burning a one as it did following the post-armistice boom. Steel producers say they will not permit a repetition of the conditions that prevailed then. Some of them, however, are seemingly ready to book once more contracts against which they know full well there will be no specifications in a declining market. This means that sooner or later these contracts will become dormant which is a polite way of saying that they will be repudiated when the market declines. Of course, there have been periods in the past when steel producers succeeded in resurrecting such lapsed contracts by announcement of an impending advance.

Pig Iron.—Automotive foundries are buying mostly from hand to mouth, the feeling that the market has reached top becoming more and more general. Increase in production as the result of additional furnaces being blown in is not as rapid as had been expected.

Steel.—Heavy automotive buying of strip steel, involving orders ranging from single carloads to 1,000 tons, has taken place. Deliveries are slow. One producer is reported to have taken hot-rolled business in 3-in. sizes and narrower at 2.25¢ against recent quotations of 2c. Wider sizes are firm at 2 @ 2.10¢, base Pittsburgh. Hot-rolled bars for early shipment are held at a premium and as a result cold-finished steel bars wanted quickly could hardly be obtained below 2¢, base. Good buying of spring wire by automotive consumers is noted and a $3 per ton advance in wire prices is predicted.

Aluminum.—The market for 98 to 99 per cent pure virgin ingots is fairly active, one inquiry for 1,000 tons being noted. Imports continue relatively heavy but most of the metal arriving has been sold.

Copper.—The market is steady.

Calendar

SHOWS

Nov. 13-18 — Chicago, Annual Show and Meeting of the Automotive Equipment Association.

FOREIGN SHOWS

March 10-July 31—Tokio, Japan, Peace Exhibition.

May — Shanghai, Exhibition of Road Building Material.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

May 6-21—Scheveningen, Automobile Show.

May 24 - June 5 — Barcelona, Spain, Automobile Show under Dealers' Direction.

May 28-June 5—Prague, Motor Show. Hotel de Ville.

July 1-24—London (Olympia), Aircraft Exhibition.

Sept. 1922 — Rio de Janeiro, Brazil, Automobile Exhibits in Connection with the Brazilian Centenary Associação Automobilista Brazileria.

Sept. 15-20—The Hague, Automobile Show.

Sept. 25-Oct. 3—Berlin, Automobile Show at the Kaiserdamm Hall under the auspices of the German Automobile Manufacturers Association.

September — Buenos Aires, Argentina, Annual Exhibition, Sociedad Rural Argentina.

Oct. 4-15 — Paris, Automobile Show, Grand Palais.

Oct. 12-23—London (Olympia), International Commercial Vehicle Exhibition.

Nov. 3-11 — London (Olympia), Automobile Show.

Nov. 10 - Dec. 19 — Brussels, Automobile Show, Palais de la Cinquantenaire.

Nov. 29-Dec. 4—London (Olympia), Cycle and Motorcycle Show, British Cycle Motors, The Tower, Warwick Road, Coventry.

November—Buenos Aires, Argentina, Annual Exhibition, Automovil Club Argentino.

RACES

May 30 — Indianapolis, International Sweepstakes.

July 15 — Strasbourg, French Grand Prix.

CONVENTIONS

May 19-20—St. Louis, Annual Meeting of the American Automobile Association.

May 22-25—New York, Palisades Interstate Park, Second National Conference on State Parks, Bear Mountain Inn.

June 11-15—Milwaukee Annual International Convention of the Associated Advertising Clubs of the World.

June 19-20 — Detroit, Summer Convention of the Automobile Body Builders Association.

June 19-24—Colorado Springs, Summer Meeting, Automotive Equipment Association.

June 26-July 1—Atlantic City, Twenty-fifth Annual Meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall Hotel.

August 28-Sept. 2 — Detroit National Safety Congress.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

S. A. E. MEETINGS

June 20-24 — White Sulphur Springs, W. Va., 1922 Summer Meeting of Society of Automotive Engineers.

Detroit, May 19. The Pennsylvania section will hold an outing at Torresdale or a body meeting on May 25.

New "Fronty" Racer Has Ford Features

INDIANAPOLIS, May 15 — Two Fronty-Fords entered in the 500 mile speedway race seem to have aroused considerable interest. How much are they Fords? To get an answer to this question a visit was made to the Chevrolet Brothers plant to-day, where Louis and Arthur Chevrolet make Fronty-Ford eight-valve heads for Fords.

The two Fronty-Ford cars were nearing completion, with parts here and there, so one could check up. Regular Ford motor blocks and crankcases are employed with the Fronty-Ford, eight-valve head. Beside this, special oversize, counterbalanced crankshafts are used with larger than standard main bearings. Connecting rods, camshafts and pushrods are Ford standard.

The Ford transmission, main drive, differential, radius rods and rear axles are employed with special steel drive shafts. The frame and entire front axle assembly is special, with special front semi-elliptic springs, special steering knuckles and steering mechanism. Part of the frame and chassis change was said to have been necessitated by weight requirements of the race, but the reinforcing of the frame is noteworthy. Standard cross members of Ford make are to be used, it is said.

The Delco ignition set, with all parts aluminum weighs just four pounds. Aluminum alloy pistons, invented by R. E. L. Schaap and to be manufactured by the Rels Manufacturing Co., will be employed.

First One-Man Car Since 1911

INDIANAPOLIS, May 13—Frank E. Davidson, a New York engineer, has entered the D'Wehr Special in the tenth annual 500 mile international sweepstakes race on the Indianapolis speedway May 30 and will drive it alone. This is the first year since 1911 that the rules permitted one man to ride in the car alone.

The engine of Davidson's car measures 120 cu. in. piston content, the cylinders being approximately 2½ inches in diameter and the piston traveling a distance of 4¾ inches in its stroke. Rotary valves are used.

It is announced that Captain Eddie Rickenbacker will occupy the position of starter for the race.

Shipments of Casings Continue Steady Gain

NEW YORK, May 16—Statistics of the rubber industry for the first three months of the year as compared with the same period in 1921 follow:

PNEUMATIC CASINGS

1921—	Inventory	Production	Shipments
Jan.	5,319,605	703,430	965,417
Feb.	5,193,018	819,892	1,073,756
March	4,597,103	1,163,314	1,614,651
1922—			
Jan.	4,174,000	2,055,000	1,597,000
Feb.	4,691,000	2,084,000	1,562,000
March	5,183,286	2,645,790	2,073,963

INNER TUBES

1921—	Inventory	Production	Shipments
Jan.	5,586,163	740,824	1,042,617
Feb.	5,415,464	916,627	1,129,881
March	5,044,861	1,346,483	1,643,690
1922—			
Jan.	5,247,000	2,343,000	1,890,000
Feb.	6,142,000	2,597,000	1,703,000
March	6,991,118	3,017,511	2,090,737

SOLID TIRES

1921—	Inventory	Production	Shipments
Jan.	303,753	21,220	29,116
Feb.	304,374	23,365	29,599
March	283,800	28,710	43,926
1922—			
Jan.	182,000	40,000	33,000
Feb.	183,000	39,000	37,000
March	182,197	49,433	48,350

"Production" and "Shipments" figures cover the entire month for which each report is made. "Inventory" is reported as of the last day of each month.

"Inventory" includes tires and tubes constituting domestic work in factory and in transit to, or at warehouses, branches (if any, or in possession of dealers on consignment basis, and as a total represents all tires and tubes still owned by manufacturers as a domestic stock.

"Shipments" includes only stock forwarded to a purchaser and does not include stock forwarded to a warehouse, branch, or on a consignment basis, or abroad.

Columbia Operating Highway Machinery

BARRANQUILLA, COLOMBIA, April 21 (*by mail*)—The first road grading machinery to reach Colombia has recently been put into operation and will be used on the roads joining this city with the interior, passing through the cities of Galapa, Baranoa, Usiacuri and going as far as Sabanalarga. This road, it is expected, will also connect with the one being built from Cartagena toward the same destination. The government of this department also is purchasing a tractor for use with this road building machinery.

The petroleum industry is already an accomplished fact, and it is announced here that one of the larger companies will start local sales this month, bringing the price of gasoline from 70 to 42½ cents per gallon. This is expected to improve the possibilities of automobile sales very materially.

The last quarter of 1921 was quite lively, so far as the sale of new cars was concerned, but in January and February it quieted somewhat. Some importations are being made, and the trade is expected to better itself, especially with the decrease in gasoline prices and as more roads are built. The rise of coffee prices in the United States also will put the country in a better position for the future.

The interior is quiet, particularly in Bogota, which has been hit harder than any other part of the country; but on the whole, business is improving.

FLYING MEET IN MARYLAND

NEW YORK, May 16—The Aeronautical Chamber of Commerce is co-operating with the Flying Club of Baltimore in arranging a flying meet to be held at Logan Field, Dunalk, Md., on May 30. The program embraces events calling for participation by commercial airships.